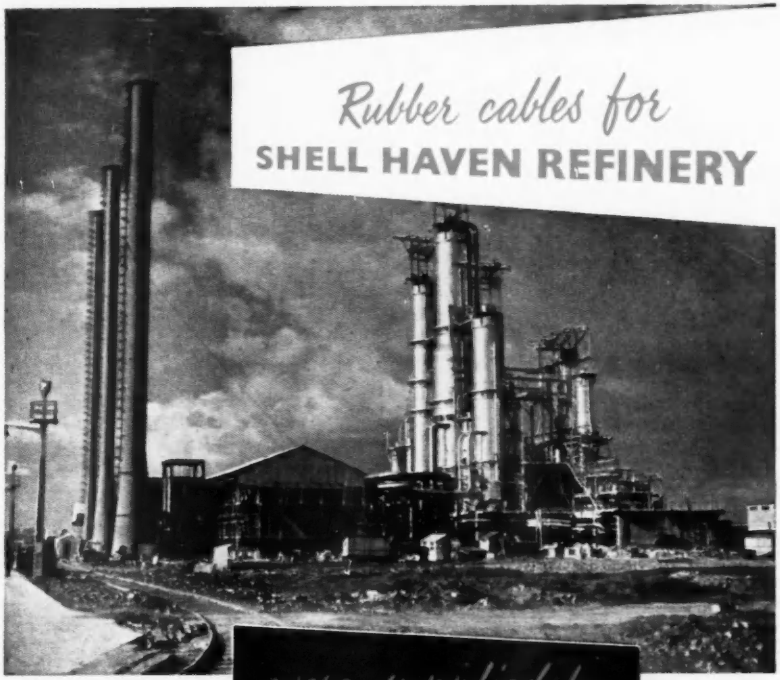
ELECTRICAL TIMES

THURSDAY
19 FEB.
1953
NINEPENCE



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(A Shell photograph)

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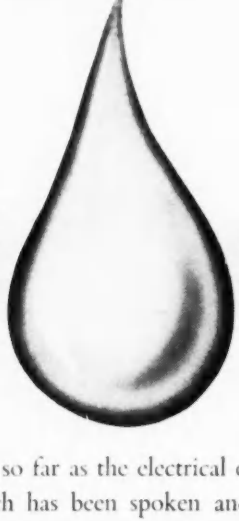
Bandit  at bay!

Public Enemy No. 1 so far as the electrical engineer is concerned is moisture, and much has been spoken and written about this menace. The only observation we would make is that one of the grades of DELARON Laminated Plastic has such a low water absorption figure that we sometimes have difficulty in measuring it.

For example, a block of DELARON Grade P.E. 1 size $1\frac{1}{2}$"x$1\frac{1}{2}$"x$\frac{1}{8}$" thick weighs approximately 6.100 grammes. If you immerse it in water for twenty-four hours and re-weigh it, you will find that it then weighs approximately 6.106 grammes, an increase of 6 mgms., representing an increase of less than 0.1% by weight.*

DELARON insulation may not be the final answer to the problem of moisture and electrical circuits, but its use does give the circuit the best chance of operating at an optimum efficiency.

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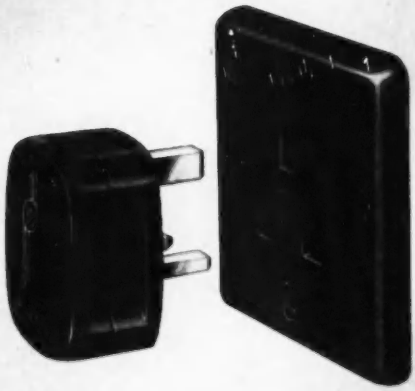

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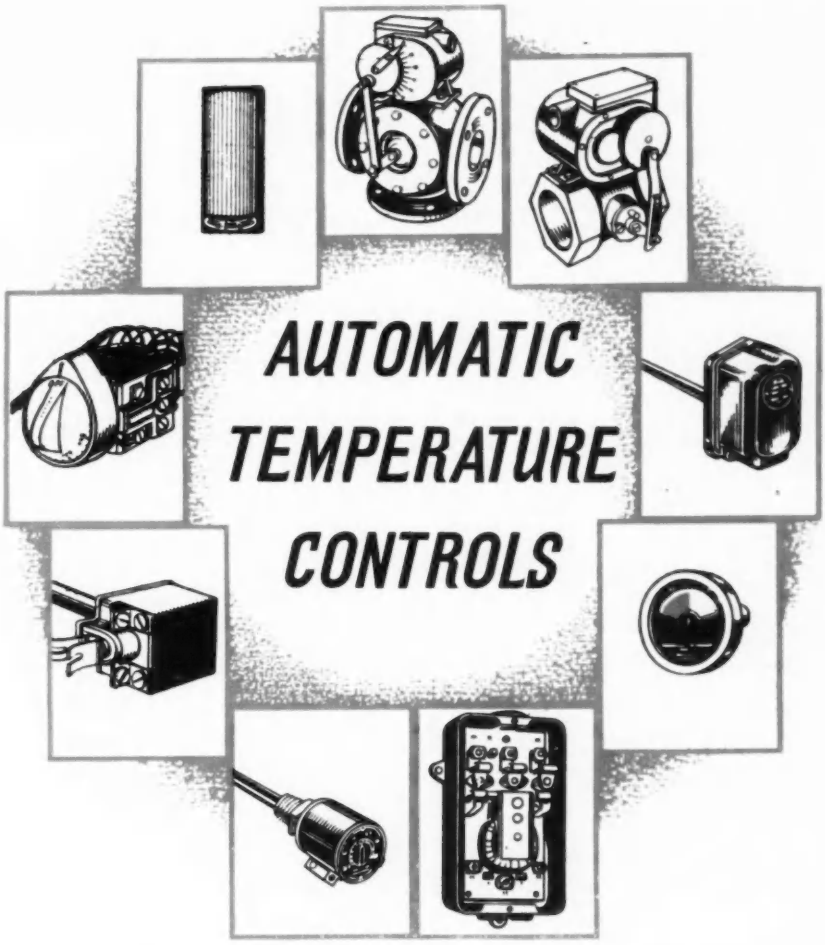

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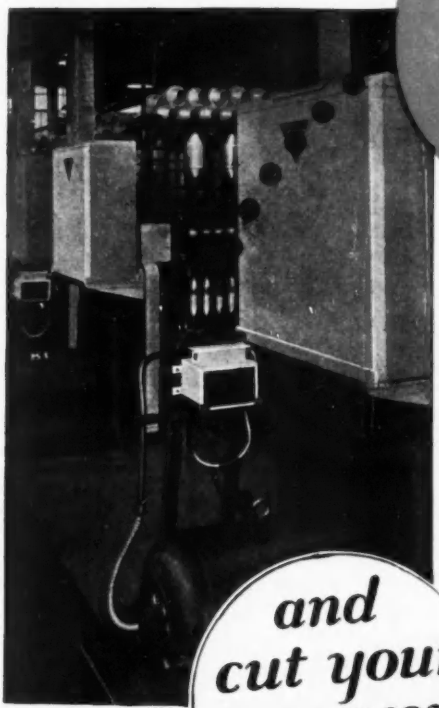

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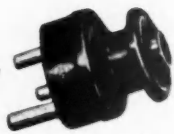
No force required to withdraw plug from socket



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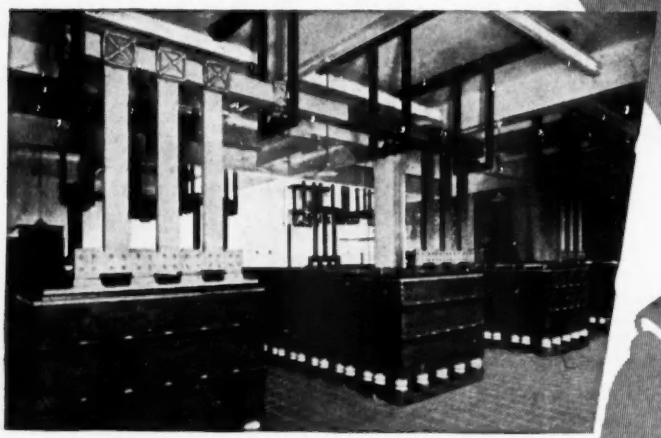

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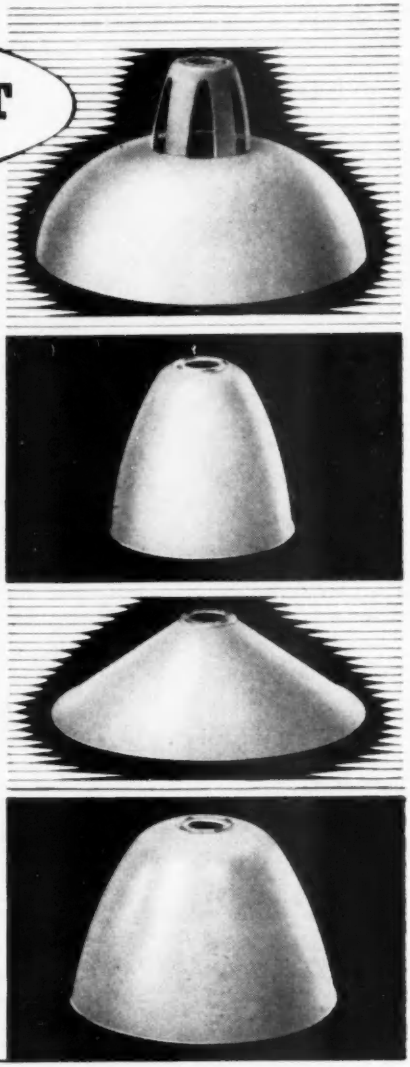

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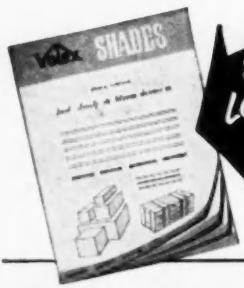

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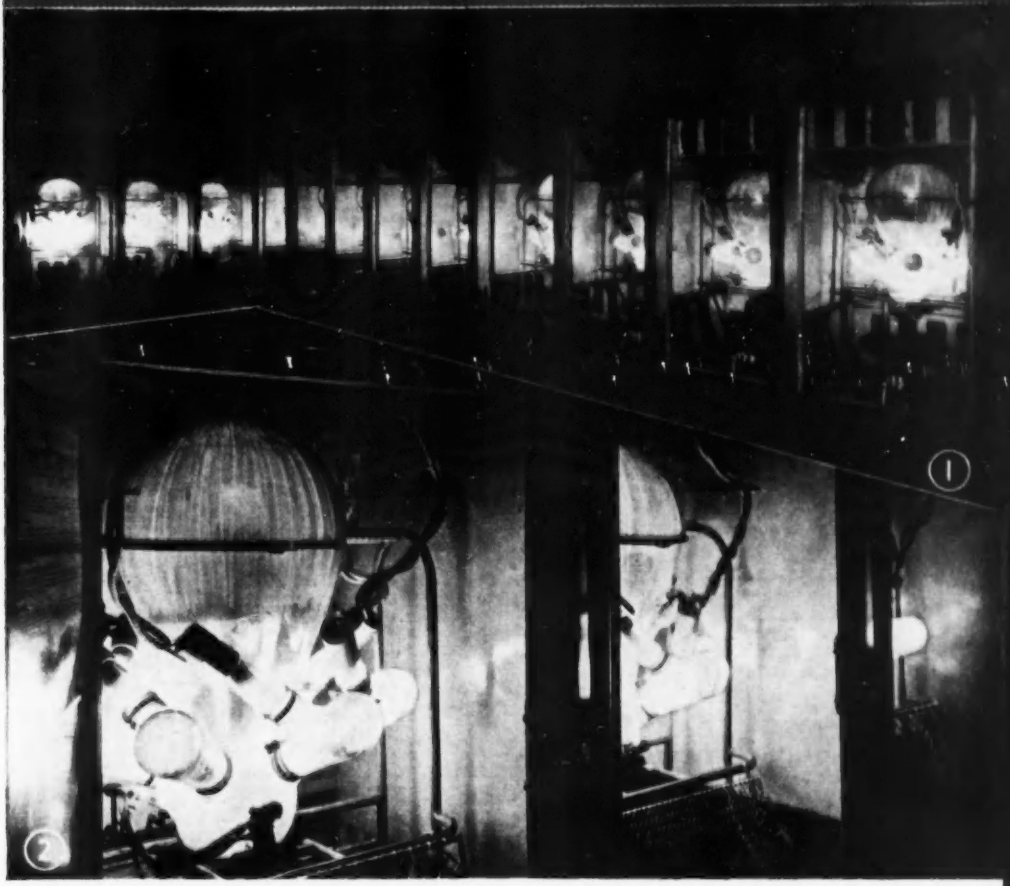

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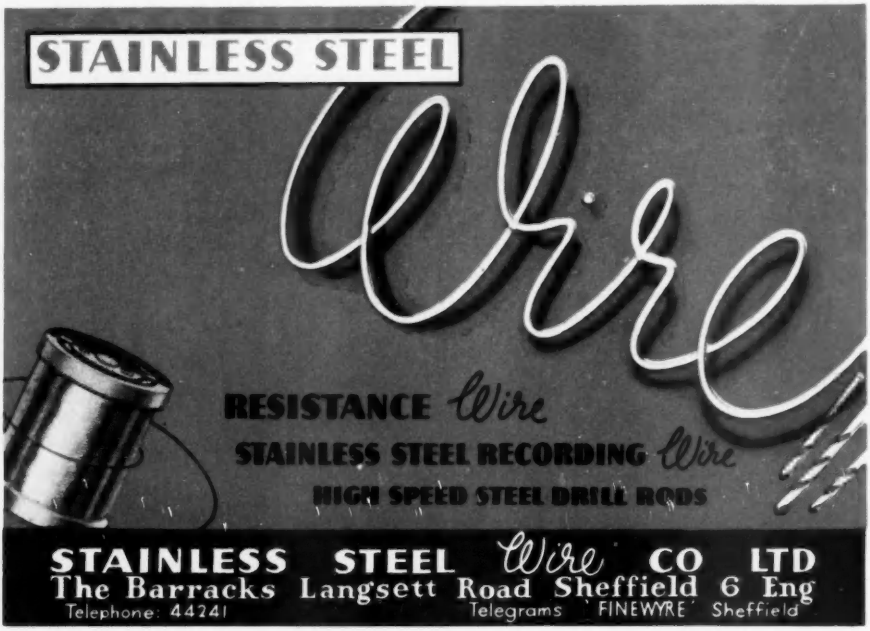
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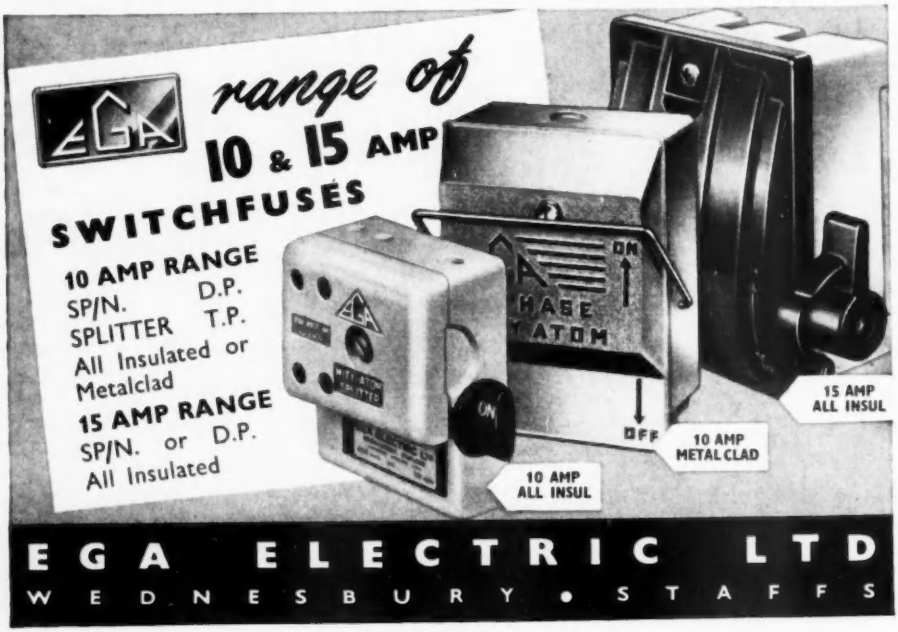
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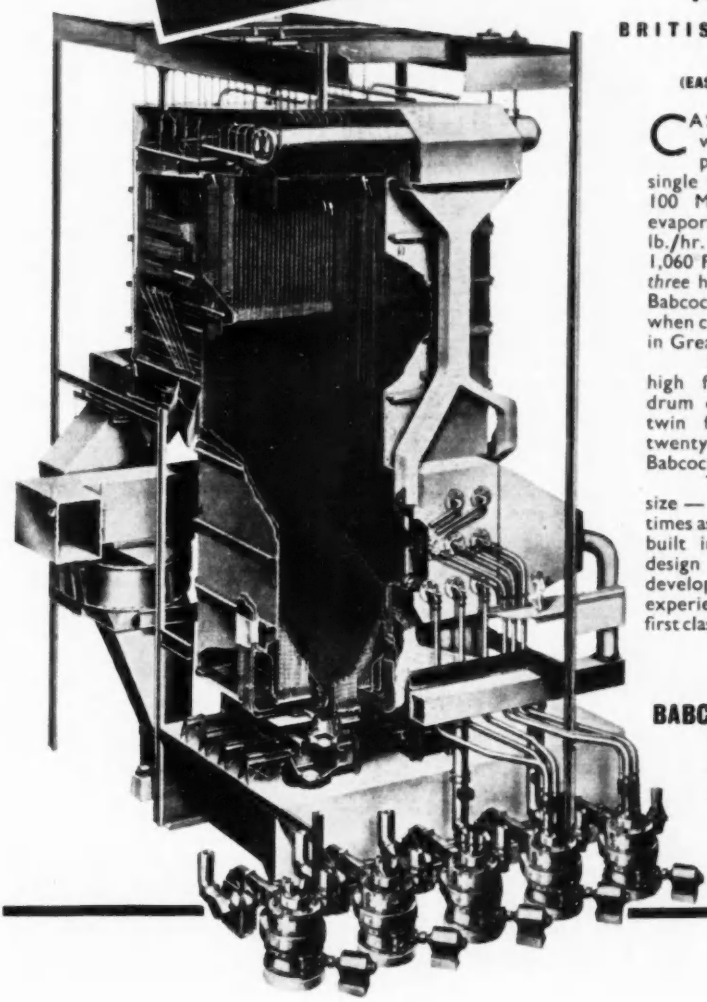

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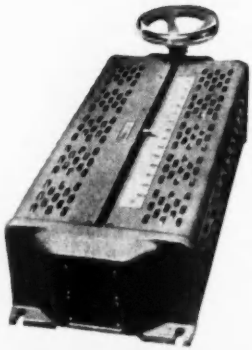

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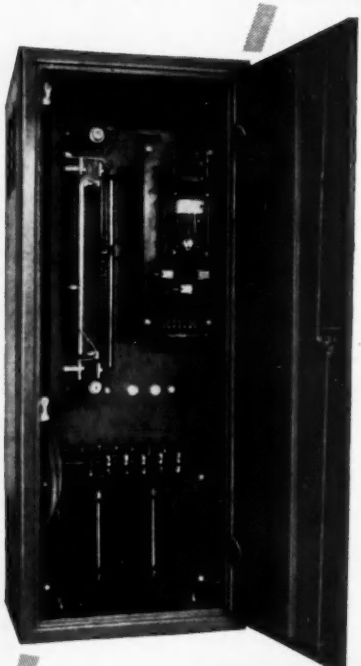
The problem of maintaining constant Voltage!



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Experienced engineers in well-planned organisations throughout the world solve this problem by installing BERCO B.P.T. "On-Load" Voltage Regulating Equipment.

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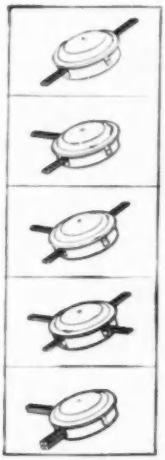

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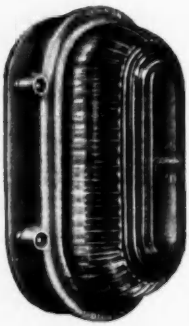

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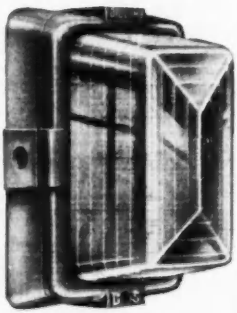

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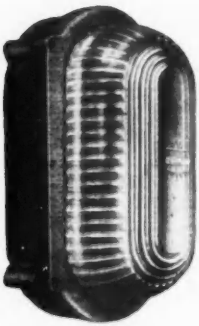

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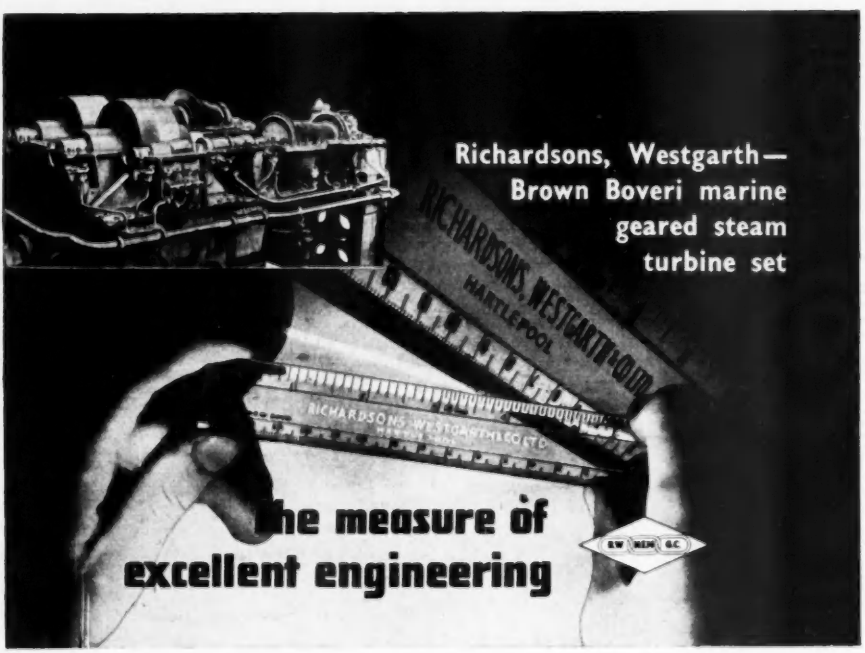
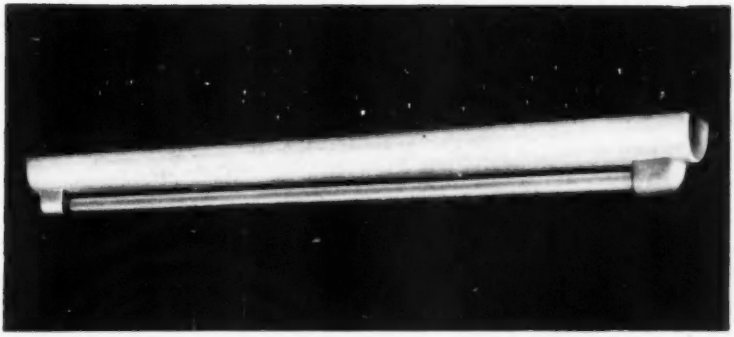


G.E.C. 80W. CHANNEL FLUORESCENT FITTINGS

REDUCED IN PRICE



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- ★ Each fitting tested before despatch and complete with high quality brick control gear.

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£5 . 10 . 0

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Instant start 200/210v. £7 . 6 . 8.

An alternative pattern F.36568/69 is available at similar prices.

Prices do not include tubes.

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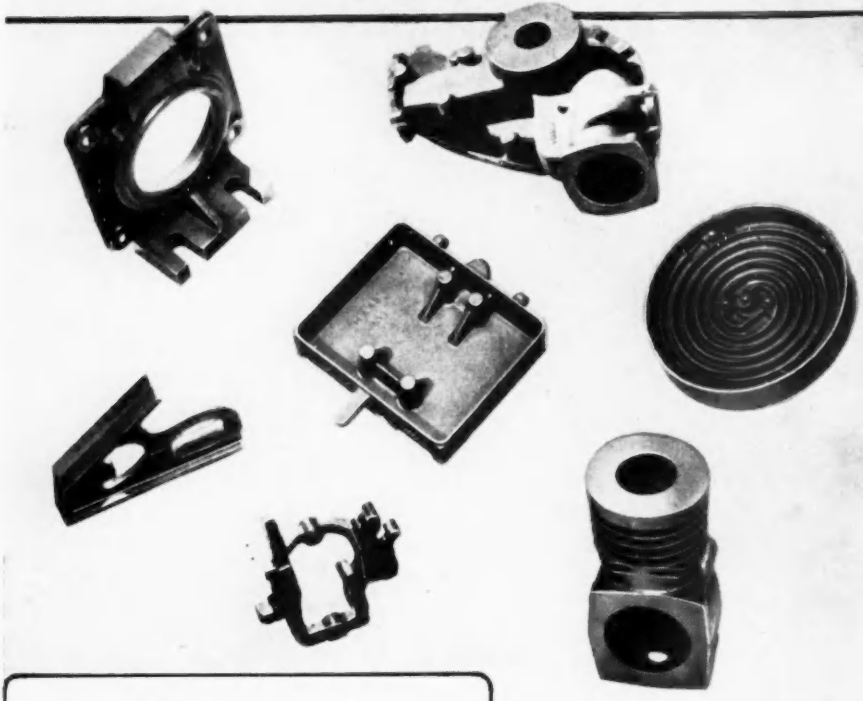

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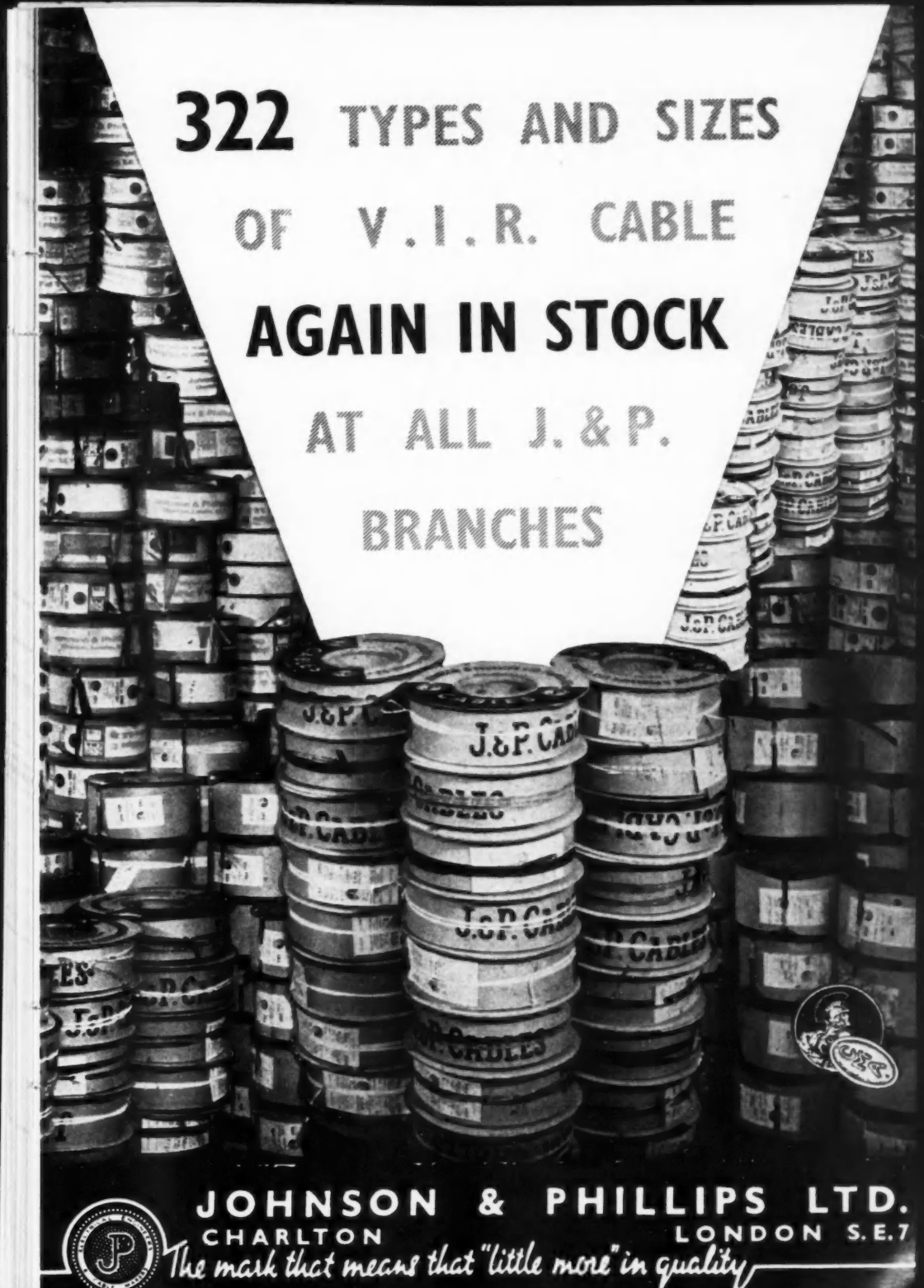
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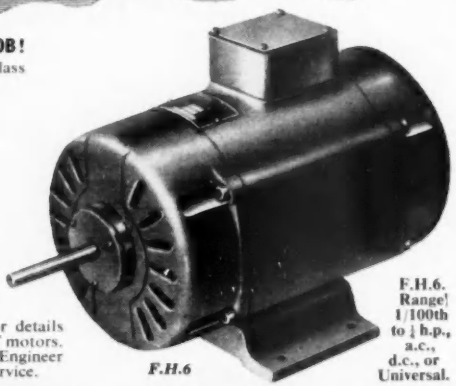

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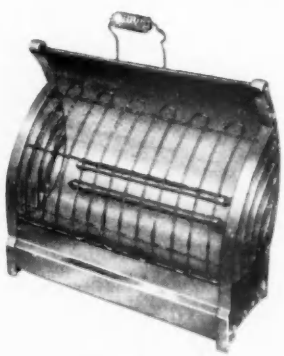

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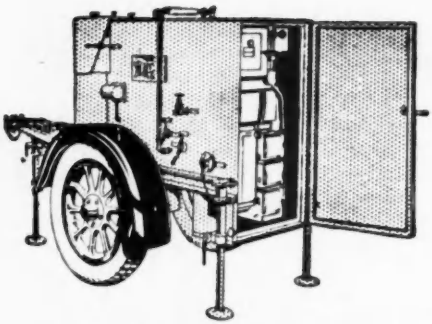

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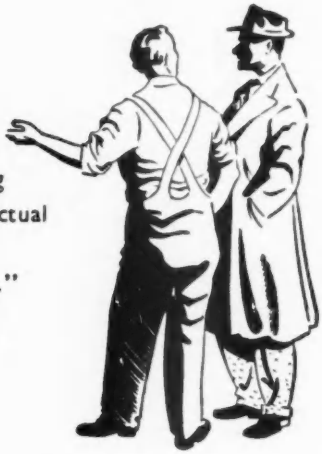

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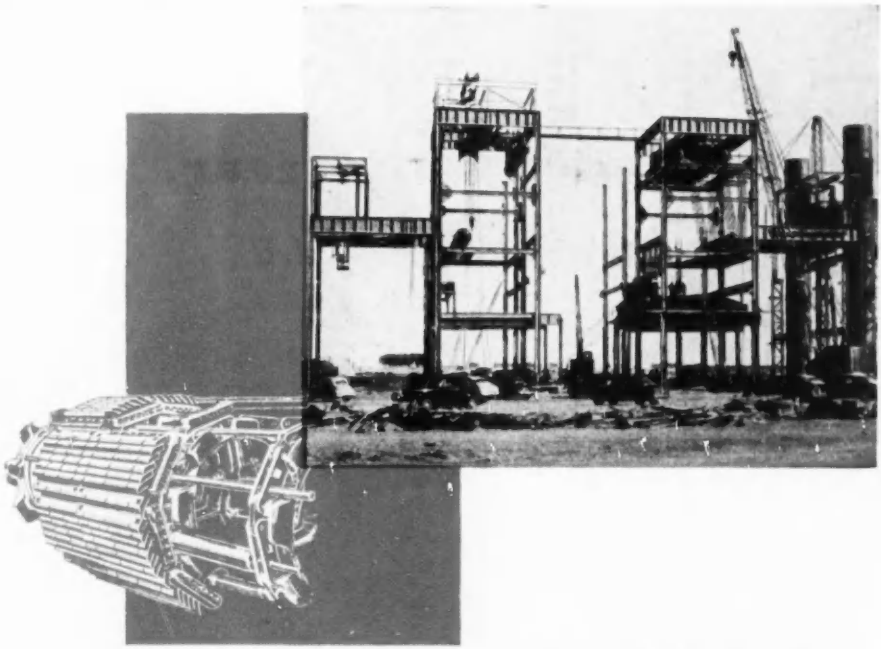

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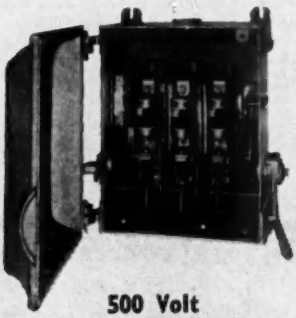

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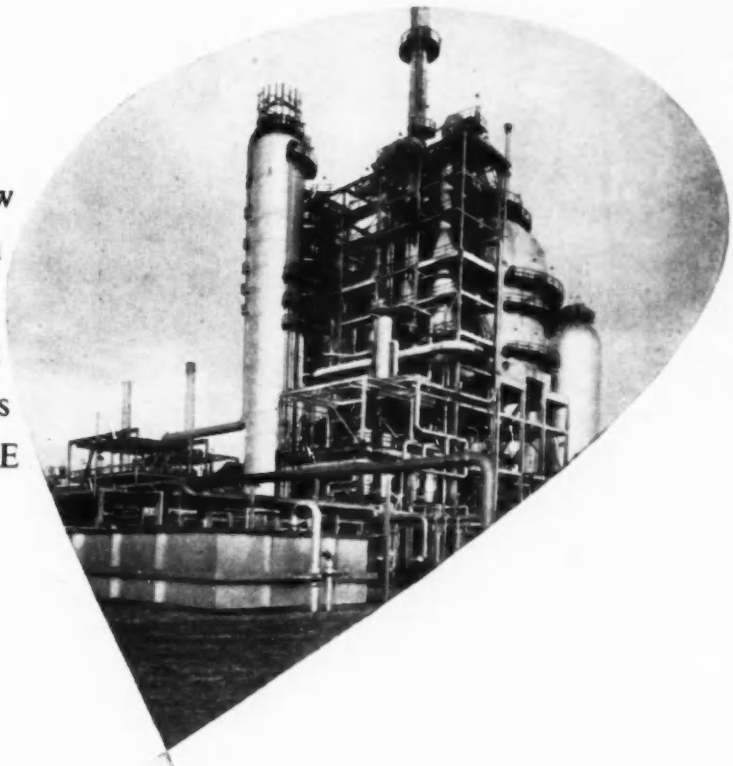

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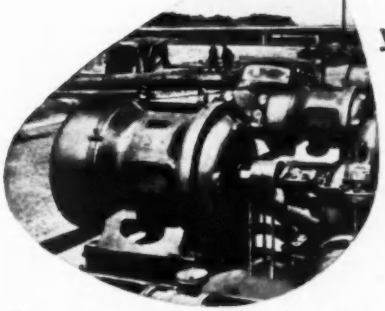

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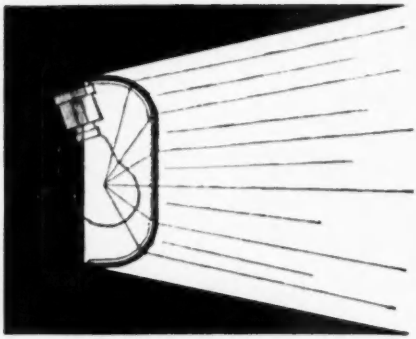

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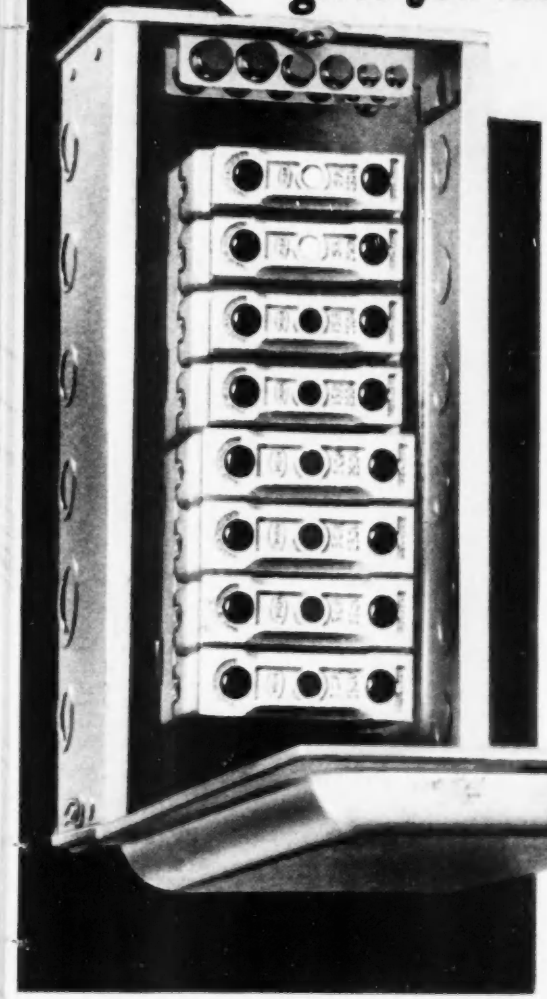

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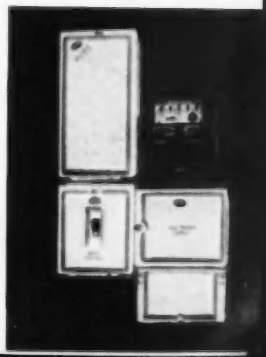

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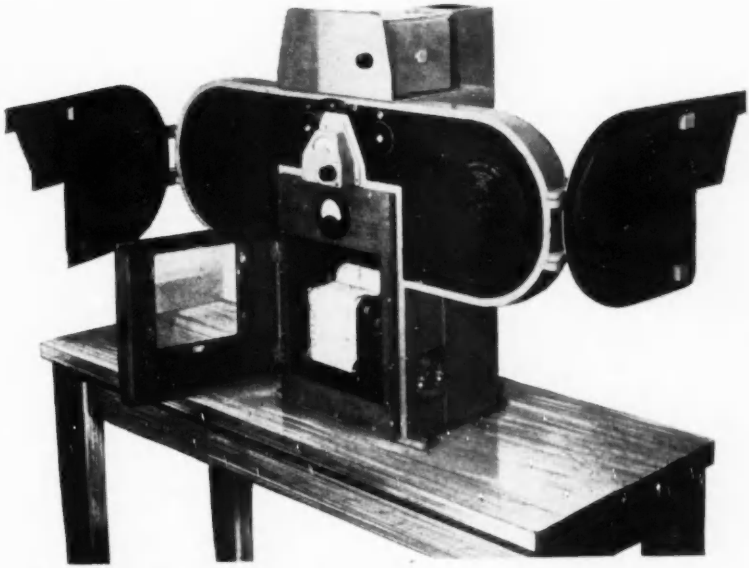

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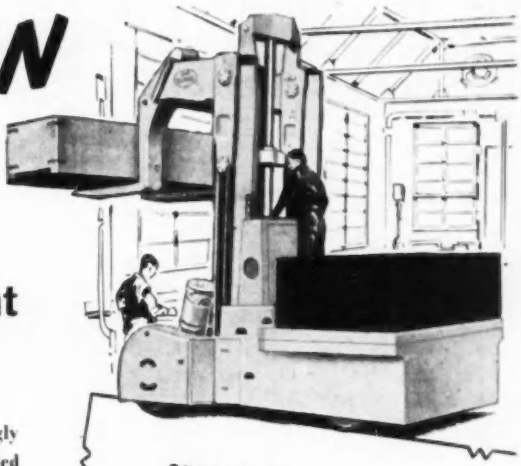

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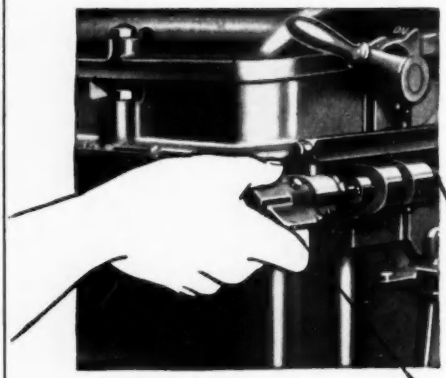

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ELECTRICAL TIMES

Volume 123 No. 3198 19 FEBRUARY, 1953

PUBLISHED EVERY THURSDAY

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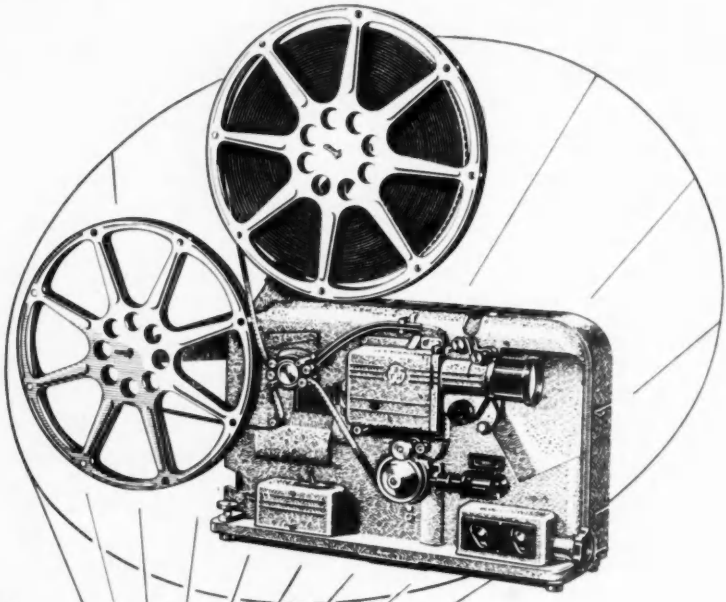

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Editorial

JUSTICE FOR HEATERS

THE decision by the Customs and Excise Commissioners to classify electrical thermal storage heaters of the type using solid block as "not of a kind used for domestic purposes" should result in a marked increase in the sales of these useful appliances, even though it does less than justice to their versatility. Exemption from purchase tax after the imposition of the full 100% rate should confirm the attractiveness for use in offices and shops of a form of heating which can qualify for specially favourable electricity tariffs where these are available, by reason of its desirable load characteristics. Apparently, this change of tax rate is a purely administrative action, quite unrelated to the off-peak nature of the heater's power-demand; yet it is impossible not to recall that in the Ridley Committee's report, the only justification offered for keeping a 100% tax on electrical heating appliances was their alleged contribution to the supply system peak. It is a change indeed to find fiscal justice done to any form of electrical heating, even through the accident of a definition.

IMPENDING INCREASE

IT seems certain that the increase in miners' basic wages which was negotiated last week will force the N.C.B. into a general price increase, for it is the culmination of a series of events that have adversely affected the Coal Board's finances. Well-informed estimates of the probable resultant rise in coal cost range from five to seven shillings a ton, which if applied to B.E.A. purchases would increase the supply industry's fuel costs by about £11m. at a time when there is little margin to meet such an increase: this without allowing for probable incidental repercussions in the cost of transport. Probably, however, the increase will be somewhat less so far as power generation is concerned, because of the graded price structure which was brought back into operation at the end of 1951, when the last general rise occurred. This departure from the war-time practice of flat rate increases, which took no account of coal quality, is by now firmly established, and in fact a new price change offers an opportunity for taking the differential further towards a balanced price structure.

CLASSIFIED INSULATION

INTERNATIONAL standardising authorities are actively concerned at present with the problem of distinguishing insulating materials with reference to their properties when heated. An important function of standardisation is the establishment of confidence as to quality between manufacturer and customer, yet standards, whilst giving this assurance, must be so devised as to present the least possible interference with progress. These two considerations conflict in the thermal classification of insulation, because with the existing standard, the results of recent progress in plastic chemistry cannot be applied to their greatest effect, and yet an alteration to this internationally agreed specification cannot be lightly undertaken, since it has for many years proved its value by the first test. When the International Electrotechnical Commission met at Scheveningen in September last, only preliminary steps towards revision were possible in the face of a split between European and American opinion on the merits of possible changes. Since then further suggestions have been evolved, and these are discussed in an article on a later page. They are worthy of close attention, for here is a subject in which the opinions of both manufacturer and user can be of assistance, and require to be publicly stated and discussed if this important standard is to be re-wrought into the best possible form.

SUPPRESSOR PERFORMANCE

THE recent correspondence, both in our columns and in the motoring journals, has shown that considerable doubts have existed among motorists as to the effect of suppressors on engine performance. Such doubts have arisen mainly due to the obvious, though fallacious, deduction that the volt-drop across the resistor reduces the available voltage across the plug points and thus leads to impaired ignition of the petrol/air mixture. The mechanism of ignition is, however, a complicated process, and the presence of suppressors may, in fact, have beneficial effects. These are particularly evident in cold starting and in plug point erosion. The general picture was well shown in a paper on the subject presented to a joint I.E.E.-I.Mech.E. meeting last week. To the average motorist the most important section was that which showed comparative b.h.p. output figures for two types of engine in suppressed and unsuppressed conditions at various r.p.m. The differences in output registered were so small and so random, that obviously no significant effect was caused by the suppressors. Further, the conclusions were confirmed by car manufacturers, some of whom have been fitting suppressors as standard equipment for some time, before the introduction of the Regulations which make fitting compulsory after July 1 of this year. Thus the last major objection to the fitting of suppressors has been found inadmissible.

TURF FOR TURBINES

FORCED to make the best of the country's relatively sparse solid fuel resources, the Eire Electricity Supply Board has had some notable success with peat-fired stations. Now a further advance is planned, with the local exploitation of turf bogs in the western counties of the Republic to supply fuel for four small generating stations. The decision is based on a well-established local industry of hand-winning turf, which will be continued to meet the needs of the new stations. There will also be the familiar story of a rural electrification programme aimed at slowing down population-drift, and built around this generation scheme. This intention corresponds with much of the work of the North of Scotland H.E. Board, and with that authority likewise preparing to use peat, the extent of the parallel raises an interesting technical question. Though few engineering details are available, the capacity of the Irish stations seems likely to be between 5 and 10 MW, which is ideal for the gas turbine in its present stage of development. Will the new Irish scheme, then, make use of these versatile machines? If so, the considerable development experience which this country has acquired will be of great value to the Eire Board, and the opportunity of applying it should not be missed.

PERSONAL PROPAGANDA

SHOULD greater responsibility be placed on meter readers than that of performing their obvious task? This question, which is no stranger to the supply industry, is raised again by a recent report in a Newcastle paper, that meter readers in that part of the world cannot pass on to the Board complaints and comments offered by the consumers whose premises they visit. They are not regarded as "appropriate channels of communication," to use the contemporary phrase. There are, indeed, some good arguments to support this practice, for the meter reader is often unable to distinguish between matters for which his Board is responsible and those which are the concern of some other authority, or of the consumer himself. Yet in any business the man who has contact with the customer can do much to produce goodwill and to effect sales. In neglecting this opportunity that the meter-readers' round offers, a chance of gaining valuable consumer co-operation may well be missed. Had it been more widely exploited, the prevailing pressure for joint meter reading might never have been built up. On balance, it would seem worth-while to invest in some extra training, so that the meter reader has sufficient knowledge of his industry's working to make him a useful ambassador to the consumer.

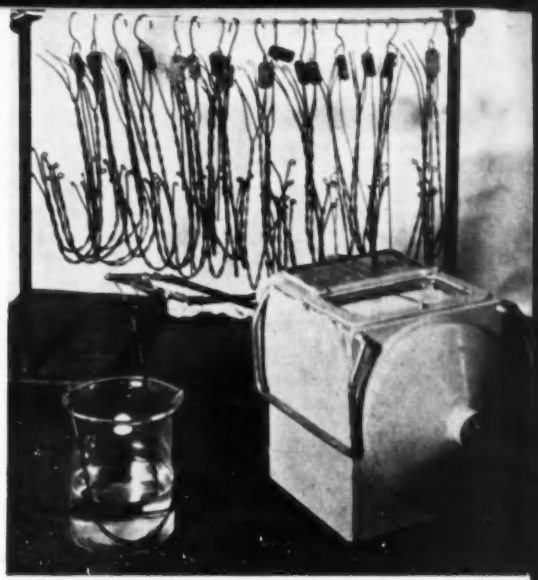
Meteor

19 FEBRUARY, 1953

INSULATING MATERIALS

Their Thermal Classification

By R. SNADOW, B.Sc., F.R.I.C.



THE realisation that substances differ in their resistance to heat has led electrical engineers to group insulating materials into classes in such a way that the members of each class could be considered, for practical purposes, to have equivalent thermal endurance. This classification has been internationally agreed, and Publication 34 of the International Electrotechnical Commission, which is concerned with specifications for machines and transformers, lists the classes as shown in Table 1.

TABLE 1. INTERNATIONAL CLASSIFICATION OF INSULATING MATERIALS BY THERMAL ENDURANCE

Class O	Cotton, silk, paper and similar organic materials when neither impregnated nor immersed in oil.
Class A	Cotton, silk, paper and similar organic materials when impregnated or immersed in oil; also the substance known as enamel applied to enamelled wire.
Class B	Mica and asbestos and similar inorganic materials, in built-up form combined with binding cement.
Class C	Mica, without binding cement, porcelain glass quartz and other similar materials.

The specifications then proceed to set limits to the temperature rises which shall be permitted for windings insulated with the various classes of materials.

American engineers, while accepting the same classes, have added a further one designated Class H. This is described in *Introduction to A.I.E.E. Standards* as consisting of (1) mica, asbestos, fibreglass and similar inorganic materials in built-up form with binding substances composed of silicone compounds, or materials with equivalent properties; (2) silicone compounds in rubbery or resinous forms, or materials with equivalent properties. In addition, the American document assigns limiting insulation temperatures—also referred to as "hottest-spot" temperatures—to the various classes as in Table 2.

TABLE 2. AMERICAN LIMITING TEMPERATURES

Class O	90° C
Class A	105° C
Class B	130° C
Class H	180° C
Class C	No limit selected.

It would almost certainly be universally acknowledged that those responsible for drawing up the present classification did a very good job. It has the great merit of simplicity and has helped the manufacturer to provide consistently reliable equipment and the user to have faith in the durability of such products. Nevertheless, there is a growing awareness, at the present time, that the classification is, in some ways, becoming obsolete.

New synthetic materials, either as fibres or films, are continually becoming available, and the engineer is left without guidance as to how these should be classified. Even if, on the basis of laboratory tests carried out by himself, or a research organisation, or the supplier, the manufacturer is confident that a new organic material will perform satisfactorily at Class B temperatures, he may still be faced with the reluctance of the customer to accept such an assessment. But this reluctance would hardly survive a new agreed classification which credited the same organic material with this

Fig. 1.—Samples used in the ageing tests on enamelled wire described in this article

degree of resistance to heat. The new textile based on polyethylene terephthalate, better known under its trade name, Terylene, can be quoted as an example of such a material. It may be argued, however, that the description "cotton, silk, paper and similar organic materials . . ." places varnished Terylene in Class A.

Synthetic Enamels

When the present classification was drawn up, "the substance known as enamel applied to enamelled wire" was a composition made from natural resins and vegetable drying oils. The description employed was adequate because, although the precise composition used by different suppliers might vary, they were all basically similar and consequently equivalent in their thermal characteristics. These oleo-resinous enamels are still widely used, but they have been supplemented and partly supplanted over the last several years by synthetic enamels with improved properties.

The best known of these is based on a combination of phenolic and polyvinyl acetal resins. BS.1844 refers to it as "enamel with vinyl acetal base," but engineers are perhaps more familiar with its various trade names; the first of these registered in this country being "Thermex."* Enamelled wire of this type is generally considered to be more heat resisting than the older type, but opinions concerning the degree of its superiority vary. It is probable that an accurate assessment would place it intermediate between Class A and B, and this immediately raises the question of the desirability or otherwise of establishing new classes intermediate between the existing ones.

Silicone materials ought certainly to receive recognition in any new international classification—as they already have in America—and a further example of a material of outstanding heat stability which has been developed comparatively recently is provided by polytetrafluorethylene.

There is no need here to elaborate further the case that can be built up for the obsolescence of the present classification, but if this case is granted, does it follow that we ought to do more than copy the American example by recognising Class H to cover the new high temperature materials?

Let us take what is perhaps one of the most contentious issues, and allow that vinyl acetal type enamelled wire has as long a life at 115° C as oleo-resinous enamelled wire has at 105° C. One way to benefit from this improvement is to continue to regard the synthetic enamel as a Class A insulation on the present basis, and limit its hottest spot temperature in, say, an industrial motor to 105° C. Assuming that failure will eventually occur through shorted turns, this practice results in lengthening—perhaps doubling—the life of the motor as compared with one wound with oleo-resinous enamelled wire. The alternative procedure is to reclassify enamelled wire in such a way that the synthetic variety is allocated a maximum temperature of 115° C and to design the motor around this temperature. For the same output, the motor that is designed to run hotter will be smaller. That is, it will use up less constructional materials—less copper and less iron as well as less insulation.

Reduced size is often an advantage in itself, but the pressing need at the present time to economise in materials gives added point to the argument in favour of exploiting to the full the improved thermal resistance of the synthetic type enamelled wire.

Effect of Classification

The difficulties associated with using new insulations not covered by the existing classification have already been referred to, and they may very well result in discouraging the use of a material which could significantly improve the manufactured product. The consequences of a strict adherence to the present classification can be summed up, then, as the extravagant use of scarce resources and the stultification of progress which could be achieved through the adoption of new materials.

This situation is being faced by the International Electrotechnical Commission, and one of its committees is charged with the responsibility of producing a new classification. The task is a difficult one and is not made easier by the need to reach agreement at an international level. By ventilating their ideas on the subject, engineers can make a contribution towards increasing the likelihood of a successful outcome to the Commission's deliberations.

As a preliminary to considering the lines which a new classification should follow, it is perhaps as well to remind ourselves of the purpose of having classes of insulation. What we are ultimately concerned with is standardising classes of equipment and rating them correctly, and so the classification should constitute a guide to this objective. There will probably be some particular apparatus corresponding to each class of insulation, but this does not mean that each type of apparatus need, or should, be available in the same

* *B.T.H. trade name.*

number of modifications as there are classes of insulation. For example, if a new class, which we may call X, is introduced, we might get Class X industrial motors replacing, say, Class A motors of this type, but we could still have Class A transformers without any Class X transformers. Thus, it does not follow that an increase in the number of classes of insulation must be accompanied by an increase in the number of classes of apparatus. Decisions relating to apparatus should be taken by those interested in drawing up the appropriate specifications. They are not the direct concern of those classifying insulating materials.

The division of insulations into temperature groups should also serve as a guide in cases where different parts of an equipment attain different temperatures. A clause in the existing classification deals with this situation and countenances the use of materials drawn from different classes, provided the temperature rise attained by each material does not exceed the limit permitted for its class. Some such clause should be retained. Although it has not been used a great deal, it may become of increasing value in conjunction with a more detailed classification.

Listed Materials

In the past, the use of the descriptions "organic" and "inorganic" has been relied upon to help define materials, but these terms have become less significant for our purpose. It is not—as is sometimes maintained—that the distinction has become blurred. The scientific definition of organic substances as compounds of carbon remains quite precise, but as a result of the development of more heat-resisting organic insulating materials, it is necessary to find some other way of describing them. The suggestion that is finding most favour in the I.E.C. is to list by their technical or chemical names the materials falling into each class. It is appreciated that such lists cannot be truly exhaustive and will have to be supplemented from time to time. It is intended, rather, that they should be put forward as typical materials in the class, while attempting to make the lists reasonably comprehensive.

There is agreement that the classes should be associated with maximum temperatures. This is a departure from the present I.E.C. classification, but conforms with the American procedure. To quote maximum temperatures can be a little misleading, because they are apt to be fallaciously regarded as "safe" temperatures; to give rise to the idea that above the

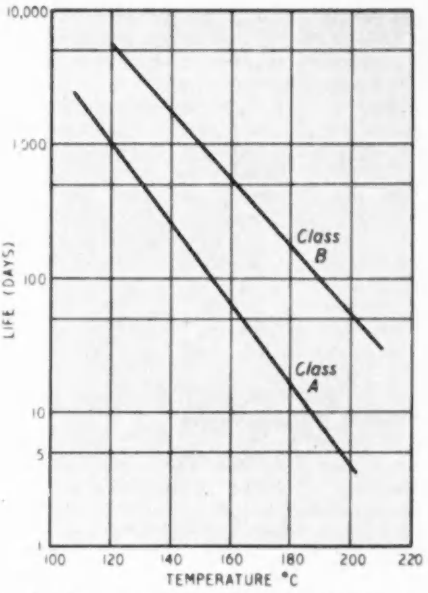


Fig. 2.—Temperature/life relationships found with Class A and Class B insulations

permitted temperature the insulation will deteriorate, while below it heat-ageing will not proceed. Unfortunately, most of the materials that we have to rely on will gradually deteriorate at any feasible service temperature, but the rate at which they do so increases as they get hotter. A useful rough rule—but one not to be slavishly followed—states that the life of oil-immersed Class A insulation is halved by an increase in temperature of 8° C. The corresponding temperature intervals for Class A insulation not immersed in oil, and for Class B insulation are given as 10° C and 12° C respectively. It is clear that the allocation of maximum temperatures cannot be divorced from the concept of service life.

The case of thermoplastic materials may be different. The usual limitation with these is the softening that occurs as they are heated and which is eventually manifested as plastic yield. The exact yield point is dependent upon the prevailing mechanical forces, so once again the allocation of maximum temperatures is not quite straightforward. Thermoplastics, such as nylon and Terylene, which have high softening temperatures, are not limited by these but by the effects of heat-ageing.

Service life depends not only upon the temperature at which a material is used, but also upon the way in which it is used. In the

normal course of events, the mechanical resistance of the insulation decreases progressively through heat ageing until eventually the mechanical forces to which it is subjected damage it to a degree that allows electrical breakdown to take place. There are two variables here. First, the mechanical forces acting on the insulation vary from one type of equipment to another. They may arise simply from differential expansion and contraction, or other factors such as vibration and centrifugal forces may also be involved. The sum total of these will change not only from one piece of equipment to another, but also between different places in a single piece of equipment. The second variable is the degree of deterioration which can take place before failure results, and is bound up with the voltage stresses imposed on the insulation.

It is obvious that we cannot legislate for every case. The new I.E.C. proposals are, therefore, to allocate temperatures to classes to serve as a guide in most applications, but to recognise that instances will arise when lower or higher working temperatures are appropriate. Such instances would be catered for in the permitted temperature-rises specified subsequently for particular types of apparatus.

Thermal Characteristics Only

No classification can be based on more than one independent variable, and since we are concerned with thermal characteristics we cannot take into account, at the same time, such important properties as mechanical strength and electric strength. It must be left to the design engineer to select materials suitable to his purpose in these respects, and to use the optimum thickness of material for the duty he will impose on it. He already has an appreciation of the rate at which the commoner Class A materials age at 105° C, and if a new classification indicates to him the corresponding temperatures at which less familiar materials age at a similar rate, it will do all he asks of it.

It must be admitted that the data we can bring to our aid in formulating a new classification are of a somewhat nebulous character. Numerous laboratory tests are, of course, conducted on a new material as soon as it becomes available, and any of these which are concerned with the change in properties resulting from prolonged heating are relevant. A difficulty is that if such tests are not to take an inordinate length of time, they must be carried out at temperatures well above those at which the materials will be used and the results extrapolated to service temperatures. Preferably tests should involve a direct comparison with familiar materials.

Suitable Tests

For flexible sheet materials, whether woven, e.g. cotton, nylon, Terylene, or in continuous form, e.g. paper, cellulose triacetate, Terylene film, valuable information is provided by heating in a carefully controlled oven and determining at intervals, after allowing the samples to cool, such properties as weight, extensibility, tensile strength and, in the case of the continuous materials, bursting strength. When films contain a plasticiser the nature and amount of this initially present should be ascertained and recorded, or there will be a danger of different investigators being misled by comparing results obtained on materials which they believe to be the same, but, in fact, are plasticised in different ways. Plasticisers can have a profound bearing on a film's properties.

Rigid sheet materials, such as mouldings or laminates, should be tested for changes in dimensions, weight, compressive strength, cross-breaking strength, etc. Changes in sensitivity to moisture brought about by heating can be determined by using the test given in B.S.1137 for insulation resistance. The specimens are provided with three terminals forming an equilateral triangle, and the insulation resistance between these is measured before and after 24 hours' immersion in water. This is then repeated after periods of heat ageing. It is worth while to provide a "blank" for a test of this sort because repeated immersion and drying out might itself cause some deterioration of the sheet. The blank might be dried out at about 100° C without subjecting it to any more heat ageing than is necessary to do this.

Varnish Assessment

Varnishes may be assessed by using them to treat woven glass cloth and then ageing these composite samples. Some types of varnish, such as the oil modified alkyds, will tend to volatilise away, whilst the predominating effect on others will be the development of cracks and pinholes. The course of events may be followed by changes in weight, and by applying a proof voltage to the sample at intervals, this will pick out cracks at a stage when they may be too small to be seen. Since one of the principal benefits that an impregnating varnish confers on electrical equipment is to protect it against moist conditions, the effect of heat ageing on this property may be measured more

directly by using a simple coil wound from two parallel glass-covered wires. The coil is impregnated with the test varnish, and the insulation resistance before and after a period in a humidity chamber is determined. This is then repeated after intervals of heat-ageing.

Enamelled wire deteriorates in service as a result of the embrittlement of the covering and the subsequent formation of cracks. An indication of the relative rates at which different types of enamel will become brittle is given by winding samples of the wires on a mandrel after heating. The periods for which the various types of enamelled wire can be heated before the coverings show cracks on being wound around, say, a 2 in. mandrel may be compared. This test is open to the objection that the end point determined in this way does not correspond to a condition which would cause failure in practice. If a winding which has broken down between turns as a result of heat-ageing is examined, it is found that the enamel is so brittle that it cracks and flakes off almost at a touch. The possibility exists that an enamel X might reach the stage where it fails a mandrel test much more quickly than another enamel Y, but that, subsequently, the rate at which X ages might decrease, while the rate at which Y ages might remain constant or even increase, so that in service Y would fail before X.

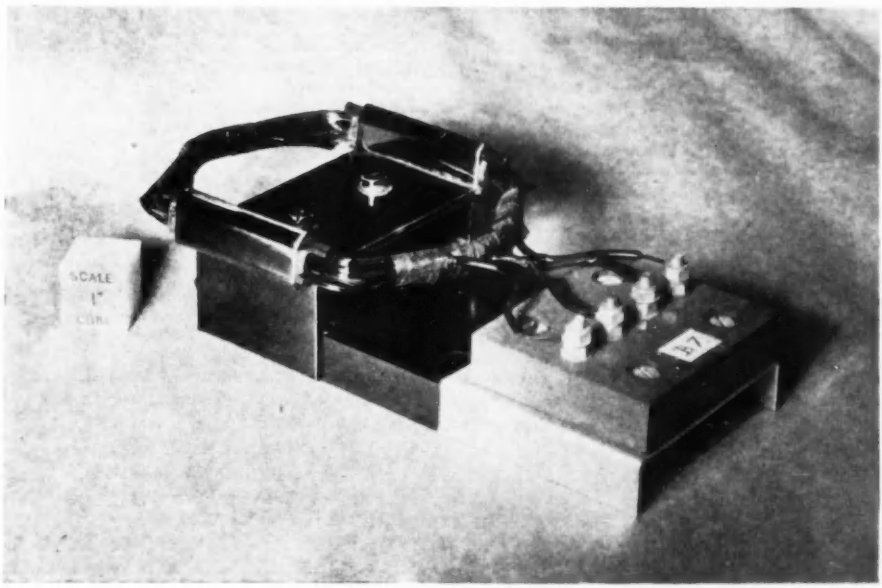
Practical End Point

In an attempt to devise a simple test that would give an end point nearer to that experienced in service, the author has made use of the following procedure:

Two wires are twisted together to form a sample similar to that specified in B.S.156 for the electric strength test. The specimen made in this way is then formed into a U by bending it around a former. The test consists in heating a number of these samples in an oven, withdrawing them at regular intervals and immersing them in a beaker of water with the ends above the surface. The resistance between the wires is then measured with a 500 V insulation tester. Usually, the resistance is found to be greater than 100 megohms or to have fallen to zero, showing that faults in the covering have developed as a result of heat ageing the mechanically stressed wires (Fig. 1).

Insufficient experience has so far been gained with this test for it to be recommended as entirely reliable, but it is outlined here in case other workers in this field should care to investigate it, or some modification of it. It is suggested that at least ten specimens of each of three different sizes of wire of a given type should be taken, and, of course, it is essential to eliminate any which, as a result of pin holes, give a low resistance in water at the start.

Fig. 3.—Model motor used in functional evaluation of insulation



For most tests some arbitrary end-point must be selected. This may be, for example, 20% of the initial strength or the point at which the insulation resistance after 24 hours water immersion drops below 1 megohm, and ageing temperatures should be chosen to allow the end-point to be reached in one to six months. If tests are carried out at a number of temperatures and these and the corresponding times taken to reach the end-point are plotted on semi-log paper, using the linear scale for temperature, the points are found to lie on an approximately straight line. The slope of this line gives the temperature increase which will halve the life of the insulation and should come out at 10-12° C. By plotting the graphs of a familiar and a new material, the temperature difference which can be allowed between them in order to give the same life may be read off. If the tests are conducted at only one temperature they are, naturally, less reliable, but the same deduction may be made by assuming the slope of the graph is such as to give a "half-life" of 10° C or 12° C according to whether the samples approximate more closely to Class A or B (Fig. 2).

From tests of this sort, supported by life tests carried out at elevated temperatures on selected pieces of apparatus, and from experience of the behaviour of many insulants under normal service conditions, a considerable body of knowledge of the thermal characteristics of materials has been built up. The I.E.C. discussions in the autumn of last year showed that there was a large measure of agreement between delegates concerning the maximum temperatures at which materials should be used, and it therefore seems reasonable to expect that a new classification based on this agreement would avoid gross errors. This is not to suggest that the need for systematic testing no longer exists. The reverse is true; more should be carried out and far more of the results obtained should be published. Nevertheless, it seems likely that the effect of this would be to alter a classification based on present knowledge only in detail, and it would seem preferable to face the probable need for such revision rather than to postpone reclassification indefinitely.

TABLE 3—PROPOSED MAXIMUM TEMPERATURES

Class	Maximum Temperature
Y	90° C
A	105° C
E	120° C
B	130° C
F	155° C
H	180° C
C	Above 180° C

Certain proposals are emerging from the I.E.C. with considerable support, but it is not yet known whether they will find wide enough acceptance to be put forward as a new international standard. These proposals are that seven classes should be recognised (see Table 3).

The materials in each class would be described by their chemical or technical names

TABLE 4—PROPOSED REVISED CLASSIFICATION OF MATERIALS—ABRIDGED LIST

Class of Insulation	Materials Included
Class Y	Cotton, paper, natural silk, rayon, aniline-formaldehyde resins, polyethylene, vulcanised natural rubber, heat-resisting grade of plasticised polyvinyl-chloride, etc.
Class A	Cotton, paper, natural silk, rayon—when impregnated with a varnish or immersed in a liquid dielectric. Polyester resins, wire enamel of oleo-resinous type, drying oil type varnish used in the presence of air, polychloroprene elastomers, etc.
Class E	Wire enamels based on polyvinyl formal, polyamide, polyisocynate or expoxide resins; phenol-formaldehyde mouldings with cellulose fillers, polyamide resins, etc.
Class B	Mineral-filled polyester resins, varnish with drying oil base used out of contact with air, varnish with oil-modified phenolic resin base, bonded mica, expoxide resins, polyethylene terephthalate, etc.
Class F	Fibrous asbestos suitably bonded, etc.
Class H	Silicone compounds in the form of resins or elastomers, fibrous asbestos, glass fibre or mica suitably bonded, etc.
Class C	Polytetrafluorethylene, etc.

as shown (by permission of the British National Committee of the I.E.C.) in an abridged list in Table 4.

U.S. Opinion

Current thought in the United States appears to be opposed to any radical change to the existing classification adopted there. Instead, there is growing support for reliance to be placed on the functional evaluation of insulation materials and systems. This involves testing materials in such a way that they fulfil the same function in the test that they would in service. The manner in which such evaluation would be related to classification does not seem to have been fully worked out so far, but the idea is to standardise a test code rather than a material. Presumably, it would be open to a manufacturer to satisfy himself by means of the code that a particular combination of insulants that he proposed to use in, say, a Class B motor could be expected to have an adequate life at the specified maximum temperature of the machine.

Cypher and Harrington (A.I.E.E. Technical Paper 52-57) have described a method for the evaluation of insulation systems associated with small and medium random-wound induction motors, and a consideration of their proposals will make clearer the kind of test envisaged for the functional evaluation of insulation systems.

The test assembly is referred to as a model motor and reproduces the essential features of the slot portion and end windings of a motor stator. Fig. 3 shows such a model motor, which is one of a number which the author is employing to carry out tests along the lines proposed. It is made up of a frame to which two pieces of sheet steel, one lying on top of the other, are bolted. These pieces are shaped so as to form two channels simulating two slots of a motor. In addition, the frame is provided with a terminal block. It will thus be appreciated that the model is quite easy and cheap to make, which is an important consideration.

Two coils, each wound from parallel wires, are placed in the outer slot plate before bolting the inner plate in position, and slot insulation and slot wedges are also included. The two coils represent two-phase windings and they are separated by phase insulation. One end of each of the parallel wires from each coil is brought out to a terminal. A voltage can thus be applied between the parallel wires in a coil to test inter-turn insulation; between the two coils to test inter-phase insulation; and between coils and frame to test slot insulation.

Having assembled a number of samples they can be impregnated with varnish and treated on the end windings so that the test embraces all the materials used in a motor, combined as they would be in actual practice. The samples are aged in a controlled oven for a specified period, removed and subjected to a standard vibration, then conditioned in a humid atmosphere. Proof voltages are applied at the various stages of the test and, provided no breakdown is experienced, the whole cycle is repeated. In this way the insulation is heat aged and resulting mechanical weaknesses, when they have reached the necessary degree of severity, are transformed into faults through vibration. The faults are made more apparent by the effects of humidity, and the test cycle consequently reproduces the chain of events typical of those leading to failure in service.

The temperatures employed in the test have to be higher than those used in normal operation in order to accelerate ageing, and the vibration conditions, though arranged to be comparable to those experienced in a motor, have to be arbitrarily chosen. The test must, therefore, be used at first to compare novel insulation systems with conventional ones whose performance in service is known.

There is much that is attractive in the standardisation of test codes rather than of insulating materials, particularly from the point of view of the large manufacturer provided with adequate facilities for testing. Such a procedure would allow maximum advantage to be taken of newly developed materials without the need for obtaining agreement on how they should be classified. The customer would, of course, be in the hands of the supplier, but this position is, in any case, only one of degree.

It would have to take several years before standardised test codes for insulation systems could be agreed upon for all types of apparatus, so that, even if this procedure should eventually find international acceptance, the case for an early revision of the classification of insulating materials remains. It does not, in fact, seem very likely that a classification of materials will be entirely superseded in the foreseeable future, even if it comes to be supplemented by standardised codes. There is little doubt, however, that functional evaluation of insulations provides a much more revealing insight into the behaviour of materials than do the simpler laboratory tests, and that it could be of immense help in future revisions and additions to a new classification of materials.

The author wishes to thank Mr. L. J. Davies, Director of Research of the B.T.H. Co. Ltd., for permission to publish this article.

Our readers' views . . .

The Fraud of Solid Fuel

SURELY it is unreal to compare domestic heating systems on a scientific basis of efficiency and B.Th.U/hr output. The basis of comparison is comfort for roughly equal cost.

My 'improved' fire is now in its second winter. It burns continuously, and as it is the only fire in the house using what is politely termed 'bituminous' coal I can state its consumption with fair accuracy (just checked against a 48-hour test). It is 27 lb for 24 hours, including dust for banking. For this I get a comfortable warmth at all meals and evenings, and most afternoons. I am quite sure I would not do as well with anything like the equivalent amount of electricity, and am prepared to put up with the soot and dust.

The fire is a distinct improvement on the reasonably modern open fire it replaced, but I neither know nor care its efficiency or output.

Incidentally, my wife, who is quite a cook, and has experienced almost every type of stove, from the 'hole in the wall,' puts the solid fuel heat storage type an easy first. I endure the shame for the sake of the results!

T. J. Barfield

ROBERTSBRIDGE
SUSSEX

• • •

I AM surprised that you should find it consistent to open an article with the words: "It is considered etiquette in business to refrain from decrying one's competitors' products," and to entitle the article "The Fraud of Solid Fuel." Your complaint that electricity as a method of domestic heating has been under continuous unopposed assault by the advocates of solid fuel is equally remarkable. It is a well-known method of polemics to defend oneself against a pretended attack, and the recent increasingly vehement defences of the electrical industry seem to me to be evidence either of aggressive intention or of a guilty conscience.

I hope that you will allow me space to comment on the major issues raised in your article. To reply in detail would take many pages.

The Egerton, Simon, and Ridley Committees all saw advantages in the use of electricity for short-term heating. So do the supporters of solid fuel. The three Committees did, however, agree that in the national interest the main winter space and water heating loads should be borne by solid fuel. That is one of the main bases of official encouragement to the use of solid fuel and solid fuel appliances, about which you have complained.

In your article you make play with the conclusion from Fuel Research Station experiments that the improved open fire and the ordinary open fire have the same efficiency when burning coal. What the Fuel Research Station have established is, however, not a reduced efficiency for the improved appliance, but an increased efficiency for the kind of ordinary one which they have tested. Under test conditions (an important qualification), the two have both given a test-bench efficiency of 27% when burning coal. You imply that this is a greater efficiency than would be obtained in actual use, but have no justification for doing so. The contrary is in fact the case, as tests carried out at the full rate of burning, as in the Fuel Research Station tests, lead to a lower efficiency figure than would be obtained at a moderate rate.

The object of the tests is to secure reproducible results in which one appliance can be fairly compared *with another of the same type*. The tests are not designed to produce the highest possible efficiency figure, and in fact do not do so. The efficiency of 27% which you quote is a radiant efficiency only, taking no account whatever of convected heat from the appliance or its surround. The figure of 27% is an unfair basis for comparison with electricity, but the unfairness is to solid fuel, not to electricity.

Your suggestion that the improved open fire is popular because it is capable of a greater heat output than an ordinary fire, owing to greater fuel consumption, is unfounded. The fuel consumption in the Fuel Research Station tests is high only because the air controls are not used, as they would be in a private house.

On coal economy efficiency, the solid fuel interests have nothing to fear from comparison with electricity even if coal-burning open fires are used. (The last Report of the B.E.A. showed that the mean thermal efficiency of the twenty most efficient power stations was under 28%, while that of many others was well below 20%.) We do not, however, rely on the open fire to maintain the popularity of solid fuel. The open fire with back boiler, the convector fire, and the openable stove (with which one

does not have to forgo the attraction of the open fire, and which does nearly half its heating by radiation) all reach thermal efficiencies very much higher than the ordinary fire, while 70% or 80% efficiency can be obtained by modern automatic central heating boilers using solid fuel

Finally, what makes solid fuel especially popular for continuous domestic heating is its low cost in comparison with other fuels. The householder may not know anything about calorific value or percentage efficiencies, but he does know what a fuel bill is when he pays it.

Eric Bellingham
DIRECTOR-GENERAL,
LONDON, S.W.1. COAL UTILISATION COUNCIL

Interference from Ignition

Minimising Effects on Television Receivers

THE major source of interference with television reception comes from the ignition system of internal combustion engines. An investigation into this subject has been carried out by the E.R.A. and Joseph Lucas Ltd., and the results were presented in a paper at a joint meeting of the I.E.E. and I.Mech.E. last week. The authors, Messrs. A. H. Ball and W. Nethercot, pointed out that although the television band only was considered in the paper, radiation frequency was not confined only to the television frequency. There was no significant change with frequency in the average level of interference from television frequencies up to 120 Mc/s and there were indications that this might hold for frequencies up to 600 Mc/s. It thus followed that for other services, both actual and potential, the frequencies above the 41-68 Mc/s television frequencies, might be adversely affected, and some of these were essential services on which the safety of life might depend.

Cause of Interference

The radiation from the ignition system—the major source of interference from a motor vehicle, came from the capacity component of the ignition spark. When the plug fired, the energy stored in the self-capacitance of the plug itself, the high-tension cables, and the h.t. winding of the coil or magneto, was rapidly discharged, giving rise to an oscillatory current with a peak value which might exceed 100 amperes. Some of this energy was radiated into space, leading to interference.

However, it was usually the ignition system which required suppression treatment, and this could be obtained by the use of resistors in the h.t. cable system. The simplest method was to insert a resistor in the distributor end of the coil/distributor cable. If further suppression was needed, sparking plug resistors, close to the plug terminals could be fitted. The effect of these resistors was to change the high-frequency discharge into a unidirectional one of much longer duration with a corresponding reduction of peak current to less than one ampere. The amplitude of the current in the inductive or "flame" component on the other hand was substantially unaltered, as the normal circuit parameters limited it to milliamperes. Experience had shown that suitable values for interference suppression lay between 5,000 and 15,000 ohms. For practical purposes, however, there was little purpose in going outside the range 10,000-15,000 ohms.

Effects of Suppression

For some years sparking plugs in aircraft had been fitted with integral resistors of one or two thousand ohms, to prevent erosion of the points. Higher values had proved to be troublesome owing to premature failure as a result of the high working temperature. New ceramic materials might solve the possibility of stability in plug insulators.

As far as the effect of suppressors on performance was concerned, the evidence showed it to be negligible, and accusations that the suppression resistors adversely affected the distributor contact breaker and capacitor had been discounted by extensive endurance tests. Cold starting (particularly in sub-zero temperatures) had been much improved by the introduction of suppressors.

The paper continued by giving an analysis of the measuring technique to be adopted, and showed several graphs which illustrated the degrees of suppression already encountered and the effect of introducing suppression equipment. The problem was, it was thought, relatively simple for new machines, but where vehicles already in service were concerned it was far more difficult.

Damping Improves Combustion

ADDITION of water to boiler slack as a means of improving combustion is discussed at some length in Ministry of Fuel and Power Fuel Efficiency Bulletin No. 53, recently issued by H.M.S.O., price 6d. The effect of adding water is shown to be mainly physical, and the optimum percentage of water varies with the fines content. A slack of 25-30% through $\frac{1}{8}$ in. requires about 5% surface moisture, while one containing 50-60% similar fines requires 10%. The moisture tends to reduce the resistance of the fuel bed, so that a much higher primary air rate may be used without causing instability of the bed. Furthermore, resistance over the whole bed becomes more uniform.

Power Station Tests

Amongst the evidence quoted in support of wetting are tests at the B.E.A.'s Burton-on-Trent station, where the coal was a free-burning fine slack containing some 55% fines through $\frac{1}{4}$ in. and about 4% free moisture. Attempts to burn this fuel gave uneven and patchy fires and a high loss of carbon in ashes, while the thermal efficiency was low and the steaming capacity restricted.

Water was sprayed into the coal stream entering the distributing chutes and approximately 700 lb/hr per boiler of saturated steam at 25-30 lb/sq in. introduced at a point approximately 5 ft above the bottom of the chute. This gave a 20% water content, equivalent to about 12% surface moisture. Good fires were obtained as a result of this treatment, and normal boiler output was maintained. Steam consumption for fuel treatment was given as less than 1% of the boiler rating.

It is recommended in the bulletin that the slack should be wetted to the point where it readily "balls" in the hands when squeezed. Washed slacks are usually already wetted entirely and uniformly. Large boiler plant requires to be equipped with a means of adding water mechanically, and at an early stage of the coal's journey to the bunkers. Where dry fines are concerned, the water may sometimes be conveniently added in the form of steam.

STANDARD FOR FIREGUARDS ISSUED

ALTHOUGH the Heating Appliances (Fireguards) Act was made law last August, regulations for fireguards have yet to be issued. A new British Standard B.S. 1945, Fireguards for Heating Appliances, was, however, published this week, and it is clear that this embodies the forthcoming regulations. The new publication is, in effect, a composite standard, bringing together requirements for guards for electric, gas and oil-burning heaters as prescribed in previous standards B.S. 1670:1951, B.S. 1250:1946, and a third still in the course of preparation.

Although modifications have been made for convenience, much of the B.S. 1670 relating to the prevention of fire risk and injury from burns from electric fires is to be found in the new standard. Covered in it are all types of electric fires used for domestic and other purposes in which there is risk of fire.

Guards for electric fires shall be of robust construction, securely attached to the fire, and designed in such a way that a specified test probe, inserted through or round it, shall not touch the heating element. This probe has the same dimensions as that specified in B.S. 1670 and shown therein as figure 2. A second requirement for the guard stipulates that when the fire has been on circuit at its maximum rated load for not less than 30 minutes, a piece of dry flannelette, when in contact with the guard, shall not smoulder or ignite in less than ten seconds. Size, weight and texture of the flannelette are specified.

As in the earlier standard, a test for the strength of the guard is specified. The test is identical, requiring that a flat disc, 4in. in diameter and weighing 5 lb, shall be placed for one minute on the guard midway between its fixing points, when the fire is mounted such that this part of the guard is horizontal. On conclusion of this test, the guard shall satisfy the probe test mentioned previously.

Those fires which are guarded in accordance with this standard shall be marked: "Guarded in accordance with B.S. 1945." A note, appended to this requirement, states that the mark B.S. 1945 is an indication by the manufacturer that the goods purport to comply with requirements of this standard. The presence of the B.S.I.'s registered certification trade mark on a product is an additional independent assurance that the product does, in fact, comply with these requirements. As the certification mark is owned by the B.S.I., it may be used by a manufacturer only under licence from the Institution.

Water-tube Corrosion

The Basic Theory of Chemical and Electrolytic Reaction—

By SYDNEY D. SCORER, A.M.I.Mech.E.

THE useful life of a water tube may be anything from a few months to as long as 15 years, but the most important single factor tending to reduce it is internal corrosion. The corrosion may take the form of general wasting which attacks all parts of the surface indiscriminately, or it may develop as pittings tending to penetrate the tube wall in a radial direction. An explanation of both forms is to be found in modern atomic theory.

Basic Theory

Nowadays it is common knowledge that, for all practical purposes, an atom may be regarded as a nucleus with a number of electrons rotating about it in orbits, much as the planets revolve about the sun. Thus helium has two electrons in a single orbit; neon has two electrons in its first and eight in its second orbit; argon has three orbits with two, eight and eight electrons, respectively; and so on. The elements cited are very stable, and cannot be forced into chemical combination with other elements.

At the same time, there are elements with unstable electronic orbits. The electrons in orbits near the nucleus are firmly held, but those in the outer orbits are liable to be detached or shared with adjacent but similarly unstable atoms. In fact, it may be said that chemical activity is nothing more or less than an exchange or sharing of orbital electrons between atoms with a surplus, and those deficient in electrons.

Unfortunately the metals, of which iron is one, tend to be electronic donors and shed some of their outer electrons as the occasion arises. Thus when a piece of steel (i.e., modified iron) is placed in boiler water containing an element of an acceptor group, such as chlorine or oxygen, some re-arrangement of electrons (to the detriment of the iron) is inevitable.

When an atom loses some of its normal complement of electrons it becomes a positively charged ion, and as such is attracted to negatively charged ions and repelled by positively charged ions. The surface ions of a piece of iron in water, as well as the ions of other elements present in the water, are thus acted on by electro-chemical forces, and a tension or potential difference (measurable in volts) exists between them. If the resultant force on the metallic ions tends towards those of the electrolyte, corrosion of the iron ensues, but if the opposing forces can be equalised, corrosion does not take place.

Electrode Potentials

For comparative purposes the potential difference of each metal is measured with reference to a hydrogen electrode, which has been chosen as the arbitrary zero. By tabulating the various measurements of potential difference an electrochemical series of elements results; those with an electrode potential greater than zero being more "noble" than those below it. For example, at a temperature of 77° F the element copper has an electrode potential of +0·345; tin stands at —0·136; iron at —0·44; and so on.

A common feature of acids is their possession of hydrogen atoms, and when an acid is mixed with boiler water it promptly partially dissociates into ions, e.g. $HCl \rightarrow H^+$ and $Cl.^-$ Even water is assumed to dissociate partially into H^+ and $(OH)^-$ (hydroxyl) ions, so that in any slightly acid water there are numerous hydrogen ions free to cause trouble. Since iron is electro-negative to hydrogen, if the metal is immersed in an acid solution it loses electrons (i.e. goes into solution) and displaces the hydrogen.

Area Differentials

Another factor is that for one of several reasons there may already be a potential difference between two areas of a steel tube containing boiler water. Because of this potential difference a small current flows between the two electrically dissimilar areas. At the anodic area metallic ions are released into the water, and hydrogen ions flow towards the cathodic area. Here the hydrogen ions attract free ions, and revert to the form of hydrogen atoms.

While this is going on the iron ions from the anodic area are meeting the hydroxyl ions in the water, and they combine to make ferrous hydroxide. If the acidity of the water is greater than a certain amount the ferrous product remains in solution, but if it is not the hydroxide precipitates out on to the anodic area and forms a protective film over it by raising its potential.

The hydrogen atoms at the cathodic area have a similar polarising effect if they are

allowed to remain in place, but when other hydrogen atoms are freely available they combine to form molecular hydrogen gas. The last-mentioned readily disengages from the cathodic surface, leaving the way clear for a further supply of hydrogen ions to the cathode and a further release of iron ions at the anode, due to the maintenance of a potential difference. In this form of corrosion there is frequent movement of anodic area attack, and the wasting of the metal surface becomes general.

Effect of Oxygen

Even in alkaline boiler water a certain amount of hydrogen evolution and corrosion is unavoidable when a potential difference exists between different parts of the tube surface, but the action is intensified if oxygen is present in the water. Polarisation of the cathode by hydrogen atoms is prevented by combination of the oxygen and hydrogen to form water. Consequently, the hydrogen atoms are removed, and the rate of corrosion is limited only by the amount of oxygen available.

However, the presence of oxygen alone in boiler water may be sufficient to start severe corrosion. To demonstrate this effect a jar can be filled with a neutral salt solution such as dilute sodium chloride, and a vertical porous partition is fitted down the middle. If, now, two plates of similar metal are connected externally through a millivolt meter, and are immersed with one plate in each half of the jar, no current will flow. But, if a stream of air or oxygen bubbles is passed over one of the plates, a large deflection of the meter results, and the unaerated plate begins to corrode.

"Anomalous" Corrosion

This is the basis of the differential aeration theory developed by U. R. Evans, and it explains a number of apparent corrosion anomalies. For instance, if soft sludge is allowed to lie in a water tube when the boiler is out of use for any length of time, it often happens that severe corrosion takes place under the sludge and not over the areas with free access to atmospheric oxygen. Again, when the mill scale on a tube exposed to oxygen is scratched or broken, intense pitting may start at the scratched place, but not elsewhere on the tube.

What happens is that the oxygen "ennobles" the aerated area by forming and maintaining over it a thin oxide film. When part of the area is excluded from oxygen by sludge the area beneath the sludge is no longer protected and becomes anodic to the rest of the tube; a potential difference is set up, and corrosion of the sludged area follows. A scratch in mill scale provides similar conditions, but in this form the anodic area is so small relative to the cathodic area that an intense local attack occurs. The tube wall may be penetrated in a short time.

From the preceding remarks it will be apparent that if there were no potential difference between different areas of a tube, there would be no corrosion. This has given rise to several suggestions intended to bring about that desirable state of affairs. One of these is that since breaks in oxide scale are a starting point for pittings, it should be completely removed from new tubes by light shot-blasting or other means. It follows from that practice that some kind of protection must be afforded to the tube when in use, and another suggestion is that conditions favourable to the formation of a protective and stable film must be provided inside the boiler.

Maintenance

As we have already seen, when acid is present the corrosion product is soluble and leaves the anodic area over which it forms. At pH values greater than 9·4, however, the corrosion product becomes insoluble. In suitable circumstances the product may deposit on the anodic area, thus raising its electrode potential relative to the cathodic area and reducing the flow of electrons between the two. This school of thought, therefore, advises the maintenance of a pH value of between 9·4 and 13 in the boiler water at all times, and, from personal experience, one would say that for average boiler practice a value of pH 10·5 appears satisfactory.

As to oxygen, which is the principal corrosive agent in ordinary water-tube boilers, it should be eliminated by de-aerating the feed water and, if necessary, adding sodium sulphite to the boiler water to remove any residue. By this means any hydrogen forming as a result of electro-chemical action is not removed and tends to polarise the cathodic area, thus stifling corrosive action.

It should be kept in mind, however, that many pittings are started by oxygen bubbles attaching themselves to the tube wall under standing conditions. The small area under the bubble becomes cathodic to the rest of the tube surface, and electrolytic action commences with the adjacent metal. The products of electrolysis form as a film over the bubble and prevent the ingress of fresh oxygen to the small area below it. At that stage the last mentioned becomes anodic to the large surrounding area of metal, and, as long as the film of corrosion products remains in place, corrosion continues at the bottom of the pitting thus initiated.

SHORT LINE CHARTS

A Graphical Method of Deriving Voltage Drop

By D. H. FRAME

THERE are many methods of working out short line regulation; the particular method described below gives the actual voltage at the end of the line.

Consider first the vector diagram, Fig. 1, which is the typical regulation diagram. This can be redrawn, as shown in Fig. 2, for unity

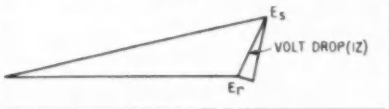


Fig. 1. Typical vector regulation diagram

power factor, and arranged so that the received end voltage vector is always vertical. In Fig. 2 we show two values of load. In this diagram AB = voltage drop for one value of load, and AC = voltage drop for a greater value of load.

It will be seen that the length of vector ABC is proportional to the load and that ordinates erected from the axis X to vector ABC represent (with the inclusion of an error) the received end voltage. In practice, where the vector OA O′A is very long, the error introduced (XO, XO′, etc.) is very small.

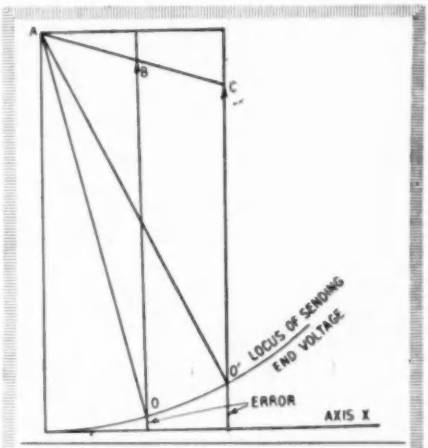


Fig. 2. Vector diagram redrawn to show construction

Construction

Using squared paper, we can proceed to construct a chart in the following manner.

Choosing a convenient axis X′X, draw X′A at angle φ to axis X where $\varphi = \text{Tan}^{-1} \frac{x}{r}$ or the internal angle of the line. Draw $\angle$AX′C at 90° to X′A and scale off X′B in kVA or MVA. Draw concentric semi-circles, centre X′, from the scaled load points, then, with focus X′, draw in lines to X′ —0·8, 0·85, 0·9, 0·95, 0·95, 0·9, 0·85, 0·8, etc. so that the angle these lines make with X′A represents the various load power factors.

Now work out the line voltage drop for a given load at unity power factor, i.e. $V = \sqrt{3}IZ$, where I is the load current and Z is the line impedance. From the point where the

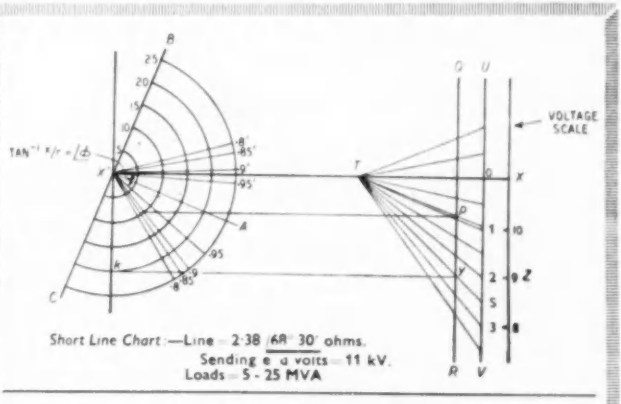


Fig. 3. Construction and use of chart

load chosen (say 20 MVA) cuts the y axis draw kZ parallel to X′X.

Now the perpendicular distance x′ k is proportional to the voltage drop due to the given load at unity power factor.

It is now necessary to correlate the voltage and load scales. Draw UV perpendicular to X′X at a convenient distance from the portion of the chart constructed and scale it in kV.

Assuming that the given load (20 MVA) gives 2·5 kV drop, choose a convenient pole T on X′X, draw TS and QR, QR being perpendicular to X′X and cutting ky at the same point (1) as TS. Draw in T1, T2, T3, etc.

The chart is now ready for solving problems for the particular line, e.g. 10 MVA at 0·9 pf, lagging.

The parallel to X′X cutting the 10 MVA circle and the 0·9 PF lag line cuts QR at p. Draw Tp extended to the UV axis. Read off the voltage drop, 0·94 kV, on UV, or the received end volts on the voltage scale, 10·4 kV, noting that a small error is introduced due to the circular locus of the sending end voltage (see Fig. 2).

It can be seen that a percentage scale can be added if necessary.

For accurate results an error curve can be calibrated to the projection of the load (along its power factor line) on to the X′X axis.

Statistics in Engineering Economy

LAST week the Study Section of the Royal Statistical Society demonstrated that for industry and commerce, figures can make money. By this cryptic remark is meant the application of statistical methods to the solution of problems, effecting thereby either reduction in costs or increase in revenue.

Case Histories Described

Although four case histories of this method were described, each being an application in different fields, one had a direct bearing on the electrical industry. It is perhaps characteristic of the technique with which this subject may be applied to engineering industries generally. Described by Mr. J. Murdock, of the English Electric Company's Operational Research Division, the application of these methods was made in an attempt to improve the company's internal railway system in preference to taking the alternative step of building a second railway. The layout of the factory was such that the existing railway, a straight length of single track, served a line of production bays running its entire length on one side and a second group at one end on its other side. Four trucks ran on the railway, driven, either individually or in groups, by a single tractor.

This works is engaged in building turbines, which involves a two-way traffic on the railway system. In view of this and other factors, considerable congestion ensued, resulting in lengthy delays when work was to be moved from one bay to another and corresponding losses in production. Managerial discussions, attempting to find a suitable solution, had reached the conclusion that only by building a second track, at the far end of the production line, could the delays be eradicated.

The Operational Research Division was however, given the task of confirming the above conclusion. A team studied movements on the railway, recording times for each separate stage from the request for transport to the unloading of the work at its destination. Having then a clear picture of conditions a statistical "model" of the system was constructed, from which a closer study of the railway operation could be made. They found that although some stages could be speeded up by stricter control, a far greater reduction in delays could be effected by merely introducing a second tractor into the system.

Time Saving

In fact, operating the new system, it was found that the average time taken to move work had been cut from 51 to 29 minutes. Moreover, it was possible to handle up to a 50% increase in production without overloading the railway. This application of statistical methods served to demonstrate that not only does the method present management with an objective solution to a given problem, but can save considerable expenditure.

Experiments had been conducted by the London Transport Executive to ascertain the value of using a lower viscosity oil in their buses. Although a high viscosity oil has certain advantages, it increases the time taken for engines to reach optimum working condition, with resultant increased fuel consumption.

At the conclusion of lengthy tests, it was concluded from results that an annual saving of up to £¼m. would obtain from the general adoption of a lower viscosity oil. In fact, the saving to the L.T.E. has averaged £200,000 each year.

NOTES ON WIRING *by Megohm*

Electricity is Smokeless

THE fogs that have engulfed us over the past months causing serious disruptions to life, commerce and transport have given rise to questions being raised by M.P.s.

Lt.-Col. M. Lipton is reported as saying that "it was appalling and unnecessary that so many thousands should be killed by man-made atmospheric filth which almost amounted to mass extermination" and demanded that ". . . vigorous steps should be taken to reduce the loss of life by atmospheric pollution." The Health Minister, Mr. Iain Macleod, said that the Government was certainly treating this pollution as a problem of the greatest urgency and promised to consider the suggestions made that a subsidy should be given to the National Smoke Abatement Society to assist them in their endeavours to reduce the pollution of the atmosphere.

No Choice

There is no doubt that smoke abatement is an urgent problem and has been one for many years. I believe it is well worth reviewing and examining the position many new householders have been forced to accept in view of conditions prevailing over the past few years in so far that they have had no choice in the selection of heating and cooking appliances. Virtually they have been more or less compelled to use solid fuel grates and stoves. The hundreds of thousands of solid fuel grates installed in recent years which, unlike the jolly old open grate fires, burn not only all day but all night as well, must make a substantial contribution to polluting the atmosphere whether they are burning smokeless fuel—if there is such a thing—or nutty slack, which I am advised is definitely all smoke.

Sir Vincent Z. de Ferranti, M.C., said in a broadcast discussion a few months ago that damage to property by smoke emission from chimneys was estimated to be in excess of £95 m. per annum in this country alone. I can well believe that this figure will rise if something is not done soon to damp down the ardour of our solid fuel enthusiasts.

It is indeed fortunate for us that the solid fuel grate manufacturers have not the capacity to make all the solid fuel grates that would be required to convert the 12 million houses that it is estimated are as yet not converted from open fire grates to solid fuel grates! What would happen during the damp winter months in the years ahead with millions of these solid fuel grates puffing out smoke 24 hours a day is indeed dreadful to contemplate.

Clean and Cheap

Electrical energy converted to heat is the cleanest, safest and most readily controlled form of warmth and at 1d.-1·25d. per unit compares favourably with any other method of heating small premises, especially so where reasonable efforts are made to provide heat insulation. The limiting factors today which are preventing the full scale adoption and use of electrical energy are:—(a) Generating plant capacity and (b) Prohibitive taxation on electrical heating appliances.

Generating plant capacity is now slowly being built up and maybe, by adopting new ideas, cutting out elaborate building plans, over elaboration on control and protective equipment and cabling much time and money can be saved. The introduction of shift work in industry would be an important factor in levelling out the peak and improve efficiency by increasing the utilisation of available generating plant capacity. The removal of the prohibitive tax on electrical heating and similar appliances would open up once again markets for such equipment and factory space planned for the manufacture of fires, water heaters and cookers, etc. which had to be shut down a few years ago could once again be working to full capacity with the objective of producing better appliances and reducing the cost of production.

Better Health

The general use of electrical energy for space heating, water heating and cooking without doubt can be achieved in due time and its general adoption will be reflected in the better health of the Nation. Lt.-Col. M. Lipton is rightly appalled that so many people should be killed by man-made filth and there is little doubt that the cost and loss to our national recovery due to pollution of the atmosphere is considerable. The sooner it is realised that electricity is at our command and can be effectively and economically used the better it will be for us, one and all.

AUTOMATIC MOTOR CONTROL

Electronic Methods discussed in A.S.E.E. Lecture

ELECTRONIC methods of speed control which are so widely used in industry today, provided the subject for Tuesday's national lecture to the Association of Supervising Electrical Engineers. The speaker on this occasion was Mr. J. C. Rankin, B.SC., A.M.I.E.E. (B.T.H.), and he began his lecture with a somewhat detailed review of the types of valve used in electronic control. These ranged from small "hard" valves up to ignitrons carrying mean currents as high as 200 amp.

General Principles

In an analysis of the general principles of electronic control the lecturer divided the equipment into three sections. The first was the device controlling the flow of power to the motor. This could be divided into systems supplying armature power and those supplying field power. Both of these could be variable, and the controller was typically either a static rectifier or an m.g. set.

The second section of the equipment was a regulator for applying correcting action to the power controller when load conditions or requirements altered. An electronic or magnetic amplifier, or a combination of the two was usual here.

In the third and final section the task to be performed was the measurement of the error or the correcting action required. For straightforward speed control the error was measured by the difference between the voltage supplied by a potentiometer (reference signal), and a voltage proportional to speed (speed signal). The speed signal could be supplied by the motor armature voltage, compensated for load voltage drop or, for greater accuracy, from a tachometer generator coupled to the motor, which gave a voltage output proportional to the true speed.

Power Supply

For equipments supplying motors of ratings up to 40 h.p., thyratrons were generally used. In the range 50 to 600 h.p. ignitrons were the usual choice, the necessary field power being supplied through thyratrons or metal rectifiers. Thyratrons were available to carry currents up to 12·5 amps per valve, and ignitrons for mean currents of 100 and 200 amps per valve.

When an m.g. set supplied armature power, it consisted of a d.c. generator driven by an a.c. motor, being the field of the generator supplied from a rectifier whose output was regulated by the speed control potentiometer and the motor speed. An advantage of this system over rectifier supply of armature power was that regenerative braking was possible, whereas with a rectifier system, a braking contactor and resistance were necessary when braking was required. On the other hand at least two extra machines were required.

An important development which was likely to occur in electronic motor control was a method for frequent reversal which did not employ switches and contactors. One of the methods that was being studied uses a two-field series motor, separate fields being used for different directions of rotation. Supplies are obtained from two rectifier units which were electronically controlled, and the method was only suitable for low-power machines.

A second method, applicable to machines of larger horsepower, used a single armature rectifier and two field rectifiers. The armature rectifier was current-controlled during reversal of field supply and standstill, while the running speed was checked against tacho-generator feed-back.

A.C. Motors

Motors most amenable to electronic control were d.c. machines, but speed control of the a.c. induction motor was being considered. In this case the method of phase unbalance was used, two pairs of ignitrons being connected back-to-back in two lines. This technique introduced extra heating effects in the motor, but the simplicity and cheapness of the induction motor made it an attractive proposition.

In his conclusion to a lecture that was illustrated with a wide variety of industrial tasks which electronic control equipment had successfully undertaken, the author sounded a note of warning. It was not suggested, he emphasised, that the electronic control of motors was the answer to all problems, or that it was ideal for all applications, replacing all other types of equipment. Each industrial drive application required careful consideration before the most suitable type of equipment could be decided, but there was no doubt that in many cases electronic control could be applied to advantage.

PROBLEMS AND PRACTICE in Engineering

Power Factor Chart

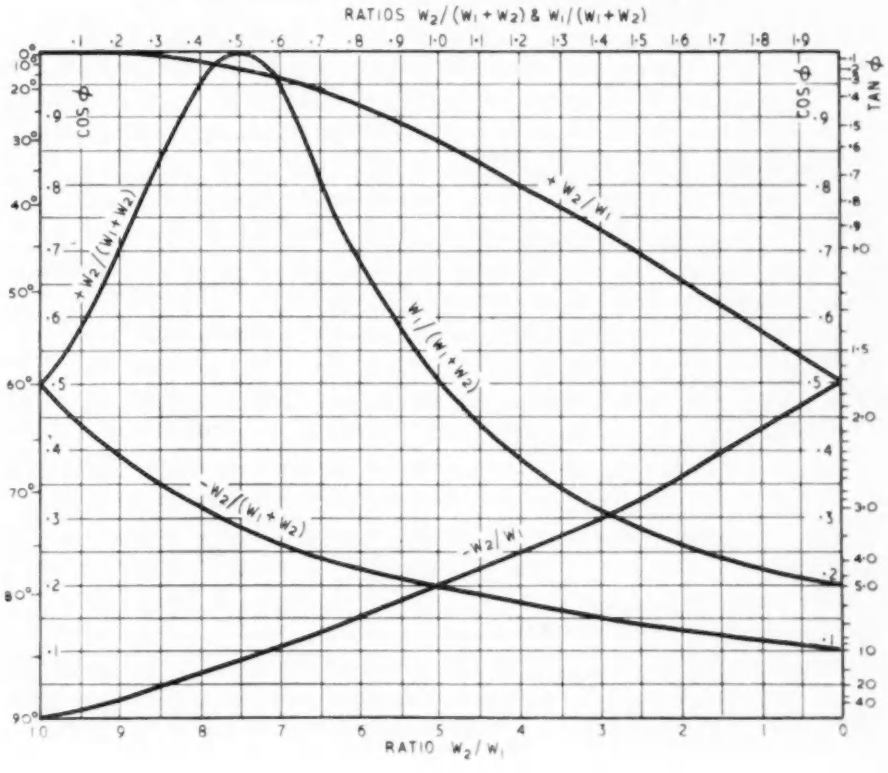
SOME years ago the writer published in these columns a composite chart setting out compactly data for use in determining power factor. This much-in-little chart is now reproduced for a later generation. It can be affixed in one's notebook, and is particularly helpful during tests on site.

It will be seen that the ordinates are marked in such manner that *cos* and *tan* values are set against a degrees scale; and of course *sine* values can be found from such information in the usual way. In P.F. measurements when sine and cosine power or energy instruments are used the tan value (and from it the value of the P.F., or of the phase angle) is given by sine value/cos value.

The curves in the chart concern the proportionate manner in which two single-phase power measurements together evaluate the power or energy in a 3-phase 3-wire circuit that is balanced in all respects. With standard phase rotation of B-R-Y one measure is of the leading-phase value W_2 (Blue current associated with Blue-Yellow voltage) and the other additional measure is of the W_2 value in the phase immediately lagging (Red current associated with Red-Yellow voltage). With lagging P.F., W_2 is less responsible than W_1 and below 0·5 P.F. it is negative; with leading P.F., the parts are exchanged.

The well-known W_2/W_1 curves are shown—ratios being +ve down to 0·5 lagging P.F. and (of course) −ve below. The writer has also

Power factor measurements chart. The W_2/W_1 scale should be × 10^{-1}

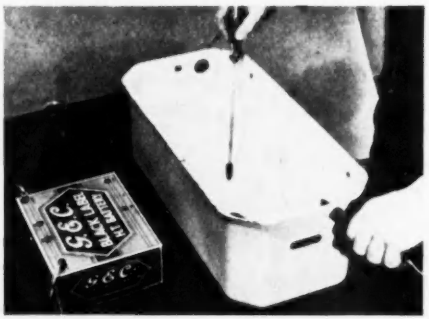


introduced curves of the relationships of W_1 and W_2 with the total. In practice, it may not always be expedient to make both W_1 and W_2 measurements separately. If the total power or energy is already being measured by one instrument this need not be interfered with; and a W_1 *or* W_2 value obtained from a second source (say, one element of a duplicate polyphase instrument).

Three final notes: with leading P.F., the roles of W_1 and W_2 are changed-over; if instrument constants or basic responses are similar, W_1 and W_2 can be in deflectional or disc-revs. values, or a similar number of disc-rev. advances stop-watched and reciprocal values applied (as, W_2/W_1 ratio from W_1 time/W_2 time); and after some metering faults the curves are of help in estimating "lost units" or the correct registration.—*G. E. Moore.*

Flaw Detection

A SIMPLE and effective method for detecting flaws in vitreous enamelled surfaces has recently come to our notice and details of it are published in this page as being of particular value to the maintenance engineer. As shown in the illustration the total requirements are a 120V h.t. battery, probe terminal, an earthing terminal and the saline solution shown in the flask.



Testing vitreous-enamelling with the detector

The vitreous enamelled body, in this case a cistern, is connected, via the earthing terminal to one pole of the battery. The other pole is connected direct to the probe which consists of a metal rod, fixed in an insulated handle, having a finger of felt or a similar absorbent material attached to its lower end. Soaked in the special pink saline solution, the finger then becomes conductive and can be used to explore any possible flaws in the enamelled surface. Should any part be bare of enamel, current will flow from the felt to the earthed cistern, visible indication being given by sparking at the flaw.

This method is at present being used by Messrs. Fordhams Pressings Ltd. to detect flaws in the enamel finish to their pressed steel flushing cisterns.

Mercury Contacts

INVESTIGATIONS were made to ascertain the reason why the circuit-breaker of a rotary convertor did not open when a fault to earth occurred on its associated transformer.

The over-current relays were tested and found to be in perfect order, being set for 150% load (current transformer ratio 300/5 amps), i.e. they will operate with 450 amps in approximately ten seconds. Each element was tested with this current and the circuit-breaker tripped in each case. The earth leakage relay, which is set to operate instantaneously with 0·5 amps, was tested and found to operate satisfactorily.

There was a smoky deposit on the cover glass of this relay and also on the inside of the case. There were also signs of electrical burning on the back of the balance weight on the moving armature (this is earthed to the case) and on the bracket which holds the metal contact fork for the tripping contacts (this is insulated from the case, as when the fork contacts are in the mercury cups it is alive to the tripping circuit).

It was observed that when this relay operates on a fault, a considerable quantity of mercury is splashed up from the cups (the more violent the operation, the larger the quantity).

The probable cause of the failure was that under the severe fault conditions, a mass of mercury was splashed up sufficient to bridge the space between the live and earthed metal. This placed a short-circuit on the 250 V d.c. tripping supply and blew the 10-amp fuse in this circuit, thereby rendering the protection inoperative.

In order to confirm the possibility of this, a permanent earth connection was put on the relay. On operating the relay, the tripping supply fuse blew before the trip coil plunger started to lift. This failure is of a type which could not have been foreseen, as the clearance is between $\frac{3}{8}$ in. and $\frac{1}{2}$ in. Subsequent attempts to repeat the conditions were not successful. Steps were taken to shield the parts concerned until a more suitable type of relay could be installed.—*M. I. C. E.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Orders and Output—1952

METROPOLITAN-VICKERS ELECTRICAL CO.

A FIRM of the magnitude of the Metropolitan Vickers Electrical Co. Ltd., covering products ranging from large turbo-alternators to electronic microscopes, cannot have justice done to it in the comparatively small space at our command. The following must, therefore, be taken as representative, but not as a comprehensive report of the work done and the orders received during the past year.

Power Plant

Starting first with steam generating plant, some seventeen turbo-generator sets, with an aggregate generating capacity of 525 MVA were put into commission at home and overseas during the year. At home, the principal B.E.A. installations were Brunswick Wharf ($2 \times 52{\cdot}5$ MW), two further sets, making three in all, at Plymouth ($2 \times 31{\cdot}5$ MW) and the sixth 45 MW set at Cliff Quay which completes this impressive plant. Overseas, the largest machine put into operation was a 50 MW turbo-generator at Pyrmont "B", Sydney, where steam conditions are 1,200 lb/sq. in. at 925° F: three further sets are on order for this station. The sixth 33 MW set at the Vaal station of ESCOM (South Africa) has been started up as has the second of four 25 MW, 22 kV machines for Fremantle, the first of five similar sets for Singapore, the second of three 20 MW units for the Hok Un (Hong Kong) station, and one of a series of 15 MW units at Nchanga copper mines, Rhodesia.

Industrial plant includes 8,300 kW and 17·5 MW back pressure sets and 11·35 MW and 23·3 MW pass-out sets for I.C.I. Two 5 MW sets have been completed for Coryton refinery (Vacuum Oil).

Orders received from the B.E.A. for the future programmes include a 60 MW unit for North Wilford, and for the 1957 programme a fourth 100 MW set has been ordered for Castle Donington, which, with its planned capacity of 600 MW will probably be the largest station in Europe. Several 60 MW and 30 MW sets are also on order, larger ones for Chadderton, Portishead B and Carmarthen Bay, and the smaller for Bold (St. Helens).

Abroad, orders came from South Africa, Singapore, Canada, Rhodesia and Pakistan.

A milestone in electricity generation progress was passed last August when the 15 MW gas turbo-generating set went into operation at Trafford Park. This plant is largely experimental and modifications are being embodied as operational experience is gained. At the moment it is burning gas oil but the design will allow for the use of preheated residual fuels at some future date. Other gas turbines are the 2,500 kW set for the Metropolitan Water Board, which is being tested at Trafford Park, and a 1,750 kW set designed to burn natural gas, which has been made for the Shell Petroleum Co., and is at present undergoing tests in Holland on this fuel.

Water Power Plant

The overseas development of hydro-resources is reflected in the work completed and in hand. Among the large units under construction are fourteen large vertical shaft generators, three of 75 MVA output for San Esteban (Spain), four of 27·8 MVA for Whakamaru (N.Z.) and three of 15 MVA for Escales (Spain), all these being driven by Francis turbines. Four 17·8 MVA Pelton-driven machines are in hand for Kiewa. Horizontal shaft machines also include two of 62·5 MVA and four of 37·5 MVA for Aura power station (Norway) and two 16 MVA for Pykara (Madras).

Large synchronous condensers in course of manufacture include a 40 MVA 1,000 r.p.m. unit for Victoria (Australia), two 30 MVA units for New Zealand, four similar machines for Spain and two 20 MVA sets for installation in South Africa.

Transformers

Many transformers, ranging in size from 5 to 60 MVA, have been despatched or commissioned during the year. Among these are a 55·5 MVA generator transformer for Brunswick Wharf; two 60 MVA units for Govan and a 30 MVA unit for Beddington. Overseas shipments have included three 50 MVA three-phase transformers, two for the Netherlands and one for Poland.

An order has been received from the B.E.A. covering four more 120 MVA 132/275 kV auto-transformers for Castle Donington transmission station. These are in addition to the three 120 MVA 13·8/132 kV generator transformers which were already on order for the power station of the same name. A 72·5 MVA

generator transformer has been ordered for Brunswick Wharf.

In the distribution field, designs have been completed for the range covered by the new British Electricity Specification T1, and several orders for units to this specification have been received from the Area Boards. A second order for fifty 500 kVA three-phase 11,000/433 volt transformers has come from the L.E.B.

Mining electrical equipment includes the first 150 kVA three-phase flameproof unit which has been supplied to the N.C.B. Large transformers of this nature have of course, been supplied abroad for several years.

In connection with the 275 kV Grid, full scale prototypes for the 132/275 kV transformers have been tested, together with the 275 kV current and voltage transformers. A new design of capacitor type voltage transformer has been developed (in conjunction with another manufacturer) to give a much improved performance on low voltages. They have been so designed that by short-circuiting one section they become suitable for 132 kV working, which will permit initial operation of the 275 kV Grid at 132 kV.

Switchgear

Many air-blast circuit-breaker units have been made or are in the making. The 275 kV 7,500 MVA units for Staythorpe; 220 kV units for San Esteban (Spain) and 165 kV units for Cabril (with English Electric) are among the higher voltage range in this class. For the 132 kV system, equipments are being installed at Carrington and eight more have been ordered. Other contracts are in hand for Tilbury and Portishead "B".

Oil circuit-breakers continue popular. Eighteen 132 kV 2,500 MVA units for Iberduero (Spain) were shipped and most of the twenty-five 110 kV breakers for service at Rosherville (South Africa) have been dispatched.

Large indoor single-break switchboards are in service at Bankside and Plymouth "B" Medium voltage equipment is in heavy demand, particularly for auxiliary services in power stations and in industrial electrification.

Industrial Plant

Many large a.c. motors of the synchronous and induction types are going through the factory or are on order. An unusual plant embodying the "Vax" system of automatic excitation is a 2,000 h.p. 125/187·5 r.p.m. rolling mill motor. With a diameter of 17½ ft this is probably the largest 11 kV motor of its type.

Winding plant using a d.c. drive includes those at the N.C.B. collieries at Mosley Common where two 2,250 h.p., 350 r.p.m. motors, supplied from two 1,525 kW, 660 V 750/600 r.p.m. generators are installed, and at Bradford, Manchester where two 1,950 h.p. motors are driven from two 1,410 kW generators. A large rolling mill motor of 4,000 h.p. 0/120 r.p.m. together with its two 1,600 kW generators was built for a South Wales steelworks.

Many of the medium and smaller motors being manufactured or on order are entailing a considerable amount of development work. More and more flameproof machines in all sizes have been required, largely for oil refinery expansion, which have necessitated the design of special machines. On certain sizes of flameproof t.e.f.c. two-pole motors, the efficiency of cooling has been increased by the addition of projectors extending from the inner casing into the outer air stream and by improvements to the air flow paths. Special motors have also been designed for marine propulsion, dredging, steelworks, and other applications.

Other industrial requirements in the fields of control equipment, particularly electronic control, cranes, lifts, machine tools, welding plant and heating, have also been met.

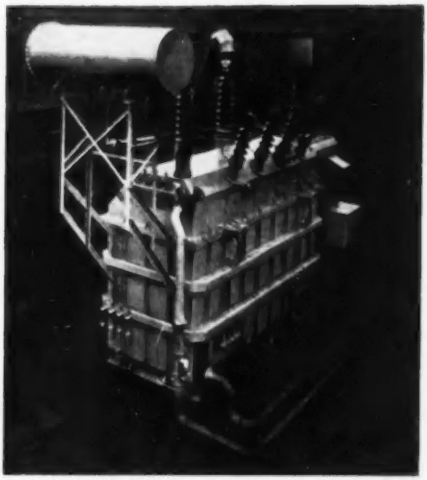
Transport

The 3,000 h.p. gas-turbine electric locomotive 18100 has been in regular service between London and Bristol and has so far completed some 60,000 miles of running. Much experience has been gained on this form of prime mover as applied to transport and several improvements introduced. For the export market some forty-eight 1,100 h.p. diesel electric locomotives are in hand—in conjunction with Beyer Peacock, Ltd.—for Western Australian Government Railways. At home, the electrical equipment for fifty-eight four-axle mixed traffic locomotives for the Manchester-Sheffield-Wath electrification scheme have been completed and twenty-five of these locomotives are already operating on the section between Wath and Dunford Bridge.

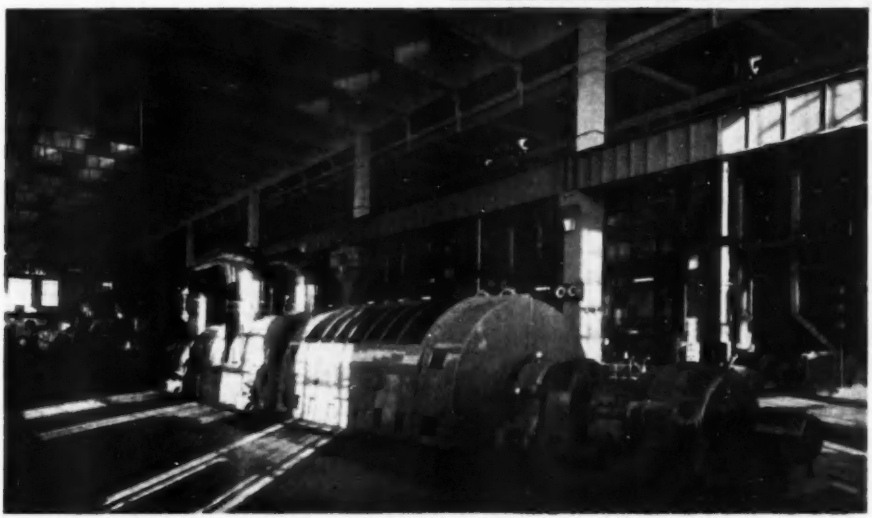
For Brazil, the twenty-four electric locomotives of the 1,070 h.p. 3,000 volt metre-gauge service have been completed, and much work has been done on the electrical equipments for forty 1,500 volt, 3,800 h.p. locomotives for New South Wales.

The company's 13 ton flameproof battery locomotive type DBF 12/1 has been approved by the Ministry of Fuel and Power and six of them are in service at Bradford and Bold collieries. Flameproof equipments are also being provided for Atlas locomotives.

Work is also in progress on overseas and home orders for tram and trolleybus equipment.



Above is an impressive fluorescent lighting installation at an L.T.E. garage, employing beam-side fittings and troughs with 8 ft. 75 W lamps. Top right is a 50 MVA 115 kV transformer for Poland on test. A flame-proof battery locomotive is shown, right, and below is a view of two of the 50 MW sets installed at Poole power station



overseas news

St. Lawrence

An urgent plea for an immediate start on the St. Lawrence power development has again been made by Mr. R. H. Saunders, chairman of the Hydro Electric Power Commission of Ontario. The plea was made at a Chamber of Commerce banquet in eastern Ontario recently. "Already the hour is late ; we say with emphasis to all in authority, the need is vital, let us get on with the job," he said. If the St. Lawrence development was completed there would be a slight surplus of power in Ontario, but without it there would be a grave shortage, he went on. The only alternative to the project was the construction of steam power stations in the province, but the operation costs of these would be more than double that of St. Lawrence power. Mr. Saunders went on to say that the Commission would consider power to the State of New York only if the price was right. Meanwhile, hearings of the Federal Power Commission in Washington started again earlier this month, but were adjourned to February 25 without a decision being given. There have been suggestions lately that approval might be withheld until the United States can work out details for a new Seaway scheme, again providing for joint participation in the deep waterway. However, Canada just as cagily has hinted strongly she would like to see the New York State's application approved before opening new negotiations.

Newfoundland Development

Further talks on the plan to develop the natural resources of Newfoundland and Labrador are now taking place in St. John's between representatives of the British syndicate of companies which has been formed and various Government officials. Mr. J. Smallwood, Premier of Newfoundland, has stated that the syndicate is to be entitled the British and Newfoundland Corporation, and agreement between the syndicate and the Government had been approved in principle by the Cabinet, only the final details remaining to be worked out. One of the firms concerned is the English Electric Co., who are interested in the hydro-electric development side.

Plant Manufacture

Since the war there has been an increasing tendency for countries previously relying on imports of capital goods to commence manufacture on their own behalf. In Brazil, the Commission for Industrial Development, for some time past, has been considering the question of the manufacture of electrical plant and apparatus. The Commission has now submitted a series of recommendations for a programme for the development of the manufacturing industry in Brazil, which have been approved by the President. According to these present plans, it is anticipated that all types of heavy electrical machinery and turbines will be manufactured in Brazil in due course.

More Plant Wanted

In the expansion of Norway's electric power resources the local plant manufacturers are now facing demands for increased output. A meeting was called recently by representatives of the Norwegian electro-technical industry to discuss with the Minister of Industries the possibilities of an increased effort on the part of that industry to aid the country in harnessing further water-power resources by expanding their production capacity of equipment for hydro-electric plant. The Minister was informed that the industry looked for some guarantee that the ambitious hydro-electric power programme would continue, before they undertook the training of additional workers and before making the capital outlay necessary to comply with the Minister's request. They also asked for import permits for machinery, and licences to build houses and workshops.

Increased Output

Sweden's output of electric power totalled 20,500 million units last year, or 1,100 million more than in the preceding year, according to Mr. Folke Petri, operations manager of the Swedish State Power Board. Only about 5 per cent. was generated by steam. The export of power to Denmark was lower than in 1951, he stated.

Power Interchange

Under a mutual co-operation agreement recently signed between Hungary and Roumania, plans have been made for the co-ordination of both countries' electric power network in the frontier area. This is part of a five-year economic agreement aimed at exploiting the natural resources of those countries to their mutual advantage.

Geothermal Power for Uganda?

Two Italian experts are to investigate the possibility of using Uganda's many hot springs to produce thermal power, the Uganda Government has announced. Together with local technical officers, the experts will visit sites in the west of the Protectorate to plan boring operations. These investigations follow a suggestion made as the result of the decision to start up copper mines in the

Bwamba area, in the Western province. There are a number of geothermal springs in this area, and it was thought that these could be utilised. The area is a mountainous one and rather inaccessible. We understand that it was principally for these reasons that the Uganda Electricity Board has turned down such a project and is constructing a power line from Jinja. But the mining concern is still interested in the idea apparently.

Reinforcement in Cape Town

Whatever the outcome of talks now taking place between representatives of the Cape Town City Council and the Electricity Supply Commission of South Africa, as to the future of electricity supply in the city, the City Council has been informed that there is a pressing necessity to reinforce the transmission system of the Southern suburbs and to provide the first of two main substations for the city and foreshore areas. In view of this the City Council has decided to undertake works which will involve the expenditure of over £1 million. The principal item will be the laying of two e.h.t. cables between Salt River power station and Diep River, on a route passing future main substations and switching stations, and the provision of two 30 mVA transformers and 12 kV switchgear at a main substation at Diep River. This work is estimated to cost £678,000. An additional 33 kV cable between Salt River power station and certain areas (including an industrial township), together with an additional 15 mVA transformer at each of three main substations, and estimated to cost £225,000 forms another part of the work. The provision of the first of the two main substations, which forms yet another part of the scheme, and is estimated to cost £115,500, will enab e current to be supplied to the city and new foreshore area when the old Dock Road power station is shut down. Included in the cost of this portion of the scheme is a sum of £50,000 for the removal and transfer of three 25,000 kVA transformers from the old Dock Road power station to the new substation and the provision of 33 kV cables for connection to the Table Bay power station.

Conference on Priorities

At Canberra during this week there is being held a Premier's Conference at which the Prime Minister, Mr. Menzies, is expected to make a statement on what he requires the Australian states to do to keep public works developments within the financial limits. Mr. Cain, the Victoria Premier, recently said that he understood the Prime Minister's view was that in the future he wanted to get the states into line, to carry out priority jobs on public works. Victoria's priorities were, firstly, education and hospitals, and, secondly, power and water schemes. He admitted that Morwell now presented a black and sorry picture, and he could give no guarantee for the future. The trouble, Mr. Cain said, lay in the fact that the Federal Government had told the two previous State Governments to go ahead with their ambitious plans for developing Victoria's power and water resources, stating that the sky was the limit. The State Electricity Company had spent £20m on the Morwell project and another £21m would be required to finish it.

Queensland Loan

A further £500,000 loan has been floated by the Queensland State Electricity Commission. Mr. Neil Smith, the State Commissioner, has said that the loan is to enable important works now in progress to be carried on. These include the power line from the new Howard power station to Kingaroy, which would shortly provide power for the South Burnett area; the line from Rockhampton to Gladstone, to be completed in the near future, and the new Townsville power station, which should be working in the next two or three months. The loan has been oversubscribed.

Preparing for Acquisition

Following the conversion of the City Electric Light Co., Brisbane, into a public authority now known as the Southern Electric Authority, consideration has been given to the position of the Toowoomba Electric Light and Power Co., whose franchise agreement, drawn up at the same time as the old C.E.L. Co's original agreement in 1939, required a year's notice from the Government if it intended exercising its option to acquire the company on February 1, 1954. The right of option thereafter was to recur annually. Now, an amendment to the agreement has been accepted by the Government and the company, which shortens the period of notice before acquisition to six months. The interval before the Government needs to act if it is to take over next February will allow negotiations for the merging of the Toowoomba company with the Southern Electric Authority to proceed. The company is already dependent upon the Authority for its bulk supply.

A Tariff Reduction

In these days of increasing tariffs it is somewhat refreshing to hear of instances where reductions have been put into force. In Queensland, the Capricornia Regional Electricity Board has announced that for consumers living outside the Rockhampton base load district, the surcharges, which varied according to the district, are to be reduced to 10%. The reduction has been made possible by the construction of the new North Rockhampton power house, which had brought big fuel consumption economies. Efficient Regional Board development of the area and State Government subsidies had also assisted.

Another Project

Construction work has started on a reservoir and three power plants on the upper stream of the Oi River, Shizuoka Prefecture, Japan, by the Chubu Electric Power Company. The project is estimated to cost 14,540 million yen. The three plants to be built will have generation capacity of 136,300 kW, 87,000 kW and 49,300 kW respectively.

PERSONALITIES

IN THE INDUSTRY

The Metropolitan-Vickers Electrical Co., Ltd., announces that **Mr. C. H. Flurscheim,** B.A., M.I.E.E., Mem.A.I.E.E., chief engineer, Switchgear Department, has been appointed assistant chief electrical engineer in addition to his present duties. Mr. Flurscheim was educated at Wellington College and Trinity College, Cambridge. He went to M-V as a college apprentice in 1927 and afterwards joined the staff of the Switchgear Engineering Department; during this time he spent a year with the General Electric (U.S.A.) as an I.G.E. Fellowship Student. In 1936, he took over the high-voltage division of Switchgear Engineering. During the war period he was responsible for the development of a series of electrical components for aircraft, including electro-mechanical undercarriages, retraction units and miniature circuit-breakers. In 1945, he became assistant chief engineer, and in 1949 chief engineer, Switchgear Department. He has read many papers before the I.E.E. and other technical institutions.

Mr. C. H. Flurscheim

Mr. William Davies, M.B.E., radio officer No. 1 in the records of the world's first marine radio company, the Marconi International Marine Communication Co., Ltd., is to have a new honour conferred on him by the Veteran Wireless Operators Association of America. This is the Marconi Memorial Medal of Service, awarded by the Association for "outstanding contributions to the wireless art," and will be presented on the occasion of the Association's 28th annual dinner-cruise to be held at the Hotel Astor, New York, on February 21. Unfortunately Mr. Davies will be unable to be present to receive the Medal in person, and Mr. R. C. Griffiths, United States representative of the Marconi International Marine Communication Co., Ltd., will accept it on his behalf. Mr. Davies was the world's first official seagoing wireless operator, as they were then called, and is still officially on the seagoing staff of the Marconi company, although he has for some time now been attached to the company's Liverpool depot for shore duties.

Mr. Ivan Stedeford, chairman of Tube Investments Ltd., left England by air for South Africa on Tuesday, February 17, for consultations with associate and subsidiary companies, and to observe at first hand general industrial trends in the Union. During a 3-week stay in Africa, he will also visit Rhodesia.

Mr. A. J. Nicholas, director of South Wales Switchgear Ltd., is shortly leaving for a tour in connection with export business in India, Australia, Canada and the U.S.

Shortly off to the British West Indies is **Mr. A. M. Manighetti,** M.I.E.E., A.M.I.Mech.E. His visit is principally in connection with electricity supply distribution for the Trinidad and Tobago Electricity Commission. He is due to sail from Southampton on March 10.

Chosen as deputy power station superintendent at the new East Yelland generating station of the South Western Division of the B.E.A. is **Mr. D. G. Clarke,** A.M.I.E.E., who is now operation and efficiency engineer at Bromborough power station, Merseyside and North Wales Division. He takes up his new duties on March 16.

The following appointments are announced by the General Electric Co. Ltd. **Mr. F. R. Livock,** T.D., B.Sc.(Eng.)., M.I.E.E., A.M.I.Mech.E., has been appointed controller—education and personnel services, and **Mr. G. B. L. Chivers,** B.Sc., A.K.C., has been appointed staff manager of the sales organisation. Educated at Berkhamstead School and University College, London, Mr. Livock served a graduate apprenticeship with Metropolitan-Vickers, subsequently joining the staff as a junior engineer. In 1933 he joined the G.E.C sales organisation in Manchester serving there as a departmental manager until the war. Demobilised in 1945 with the rank of Lieut. Col., he rejoined the G.E.C. in London as staff manager. He is a member of a number of committees concerned with education and training; and has recently returned from a tour of Latin-America as a member of the Federation of British Industries Engineering Training Mission. Mr. Chivers was educated at Richmond County School and King's College, London, graduating in physics and mathematics and being awarded the Teacher's Diploma. After war service he joined the Research Laboratories of the G.E.C. at Wembley in 1946 as staff manager, which position he has held ever since.

Mr. F. R. Livock

Mr. G. B. L. Chivers

Mr. E. H. Bucknall, vice-chairman of the Birmingham section of the Institute of Metals and a representative governor of Birmingham University is on his way to India to take over the post of director of the recently established National Metallurgical Laboratory at Jamshedpur. He was appointed by the Indian Council of Scientific and Industrial Research, and his studies will cover the whole field of ferrous and non-ferrous metallurgy, including refractory materials. Since 1944 he has been principal assistant to the superintendent of the Birmingham Laboratory, and in 1951 he represented the United Kingdom in Washington on a technical sub-committee of the International Materials Conference, being responsible for preparing the committee's report on manganese, nickel, cobalt, tungsten and molybdenum.

It is announced that the Gold Coast Government, with the concurrence of the U.K. Government, has appointed **Commander R. G. A. Jackson,** R.A.N., as special commissioner in charge of the preparatory commission for the Volta River aluminium scheme.

Mr. Alan D. Barrett left this country by air on February 10, to undertake a sales promotion trip across Africa, on behalf of Smiths English Clocks Ltd. He expects to be away four or five months.

Mr. W. V. Wright, has been appointed general manager of the Land Boiler Division of John Brown and Co. Ltd.

Mr. R. C. Harrower, has been appointed assistant manager of the Birkenhead works of the Vacuum Oil Co. Ltd.

Appointed regional manager for Central and Northern Africa and the Middle East for Hoover, Ltd., is **Mr. G. H. Peregrine,** of Swansea, who set off last week-end on a business air tour of part of his territory.

Mr. I. R. Cox, D.S.O., B.SC., M.I.Mech.E., A.M. Inst.C.E., managing director of Metropolitan-Vickers Electrical Co., Ltd., is now on his way back to England after a business visit to Australia. He is due here on March 8.

An inscribed chiming clock has been presented to **Mr. T. Atkinson,** who is leaving his post as assistant chief electrician at Lambton "D" Pit, Co. Durham, to become chief electrician at Lumley Sixth Pit, Co. Durham.

Mr. F. Green has now become the representative in South West England for South Wales Switchgear Ltd., and is based on Bristol. He was apprenticed with Ferguson, Pailin Ltd., and studied at the Manchester College of Technology. Since that time he has been in the employ of A. Reyrolle and Co., Brookhirst Switchgear Ltd., and Asea Electric Ltd., as designer and engineer of control gear, switchgear and supervisory equipment. Subsequently he was with the Military Government in Germany as a controller of electrical industries in the Aachen area of the British Zone.

Higgs Motors Ltd., have appointed **Mr. C. Williams** as technical sales engineer in the Liverpool district.

Mr. L. Soulal has been appointed manager of the Birkenhead works of the Vacuum Oil Co., Ltd., in succession to the late Mr. E. R. Slater.

Mr. J. W. Tonking has been appointed a director of Lightfoot Refrigeration Ltd.

Lord Brabazon of Tara, P.C., M.C., G.B.E., who has many associations with the electrical industry, won the Seniors Cup on the Cresta Run at St. Moritz last week, with a time of 152·1 seconds for the three runs. Lord Brabazon, who was 69 a few days ago, had previously tied with F. McCarthy, of U.S.A., but won the run-off race.

OBITUARY

Mr. Harrison Barrow, a prominent citizen in the civic life of Birmingham, died on February 15, aged 84. He was an ardent advocate of municipally-owned tramways, and was largely responsible for the corporation taking over control of the city's tramway system from the British Electric Traction Co., in 1906. Subsequently he was for many years chairman of the Corporation Tramways Committee.

Mr. Malcolm Gordon, a director William Barbour and Sons, died on February 12. He was one of the first members of the Electricity Board for Northern Ireland, but retired from the board in 1945 after a long period as chairman.

Mr. Alan P. Good, deputy chairman of the Brush Aboe group of companies, and chairman of Associated British Engineering Ltd., and of the Heenan and Froude group, died on February 10 in Capetown, aged 47. A man of considerable business acumen, he had been ill for some time, and as a result resigned the managing directorship of the group in October last, but he continued to take an active interest in the affairs of the companies. Last year he went to France to convalesce and he left for South Africa at the beginning of January. Mr. Good became deputy chairman of the Brush Electrical Engineering Co. in 1939. He was given executive responsibility in 1941 when he was appointed chairman of the executive committee and subsequently managing director. After the war he played a major part in placing the company on a profit-earning basis once more. Just prior to the war, he acquired control of and interests in many diesel engine concerns, which resulted in the formation of the Brush Aboe group, an organisation which has rapidly expanded in recent years.

Mr. Alan P. Good

Mr. S. R. Witt, B.SC.(Eng.), A.M.I.E.E., M.I.W.M., superintendent of the transformer factory of the British Thomson-Houston Co. Ltd., since 1945, died on February 12, aged 48. Educated at University College London, he gained early training with the B.T.H. Co., and with the General Electric of America. Returning to this country in 1935, first as assistant superintendent at the B.T.H. home appliance factory and then until 1940 he held a similar appointment in the small gear factory. For the remainder of the war years he was superintendent of other B.T.H. factories engaged on important work in connection with armaments. In July, 1945, he was appointed superintendent of the transformer factory.

Mr. S. R. Witt

Mr. Herbert Pounder, of the West Hartlepool electrical contracting concern of John Pounder Ltd., died at sea while on a holiday visit to South Africa. He was 68 years old.

Mr. M. F. Frankenburg, who was chairman of the Greengate & Irwell Rubber Co., Ltd., from 1926 to 1951, died on February 11.

Capt. N. Martin, B.SC., M.INST.C.E., M.I.E.E., formerly general manager, Midland Section Richard Thomas and Baldwins Ltd., died on March 12, aged 69. He studied at the Royal Technical College, Glasgow, and from 1905 to 1908 he was at Glasgow University, where he graduated in both civil and electrical engineering. In 1930 he was appointed general manager (Midland Branch) of Baldwins, Ltd., and nine years later became a director of the company. In 1945, when Richard Thomas and Co. Ltd., merged with Baldwins, Ltd., Captain Martin was appointed to serve on the board of directors of Baldwins (Holdings), Ltd.

Mr. S. W. Scrivener, director and technical manager of London Electric Firm Ltd., until his retirement in 1949, died on February 7. Mr. Scrivener will be remembered by many of the older generation as an outstanding practical engineer. Two of the largest searchlights in the world were designed in 1928 and built under his supervision at the firm's Croydon Works. He was also largely concerned in the development of span wire suspension equipment for street lighting.

BRITISH STANDARDS

Dimensions of circular cone diaphragm loudspeakers. *B.S.* 1927: 1953. *Price* 2*s. net.* Covered in this new standard are specifications for mounting dimensions of loudspeakers, affecting the interchangeability of such units. The standard does not purport to deal with performance, but in view of the important part nominal resonance frequence and nominal impedance play in the interchanging of loudspeakers, certain stipulations have been made in these values. Due to the large range of types of loudspeaker this standard is limited to that type which is, at present, manufactured in the greatest quantity.

Paper and Board Wrappers, Bags and Containers, including films, foils and laminates. *B.S.* 1133: *Section* 7: 1952. *Packaging Code. Price* 17*s.* 6*d. net.* This new section of the packaging code gives much valuable information on the manufacture and use of almost all types of paper and board packaging materials. Split up into sections, the standard covers a range of wrapping material from ordinary papers to cellulose films and other types of laminates, bags, envelopes and a variety of other containers.

Aluminium filler alloys for brazing. *B.S.* 1942: 1953. *Price* 2*s. net.* Complementary to standards B.S. 1723 and B.S. 1845, this new standard covers four types of aluminium alloy of which two types correspond to types NW2 and NW21 of B.S. 1474. All four types specified are suitable for brazing several grades of aluminium and its alloys complying with standards B.S. 1470 to 1477 and B.S. 1490. The standard specifies chemical composition and impurity limits and gives, for information only, an approximate melting range for each alloy.

Colours of light signals. *B.S.* 1376: 1953. *Price* 4*s. net.* This important standard is a revision of the original 1947 edition which was regarded as only provisional. In attempts to reconcile differences existing between colour definitions for types of signalling equipment as set out in B.S. 505, B.S. 563, B.S. 523 and B.S. 942.

Divided into three parts, the standard deals with, initially, the colour of a red, yellow, green blue, or white signal, whether from a filtered or natural source, and includes recommendations for classes for various signalling services. The second part relates to limits for certain red, yellow and green glass filters, and part three to test methods for compliance with the preceding parts.

Hand-operated circuit-breakers for extra-low voltage d.c. systems in aircraft. 2*G* 121: 1953. *Price* 2*s.* Circuit-breakers referred to in this standard cover a range of normal current ratings from 2·5 to 50 amps. They are of the quick make and break type and shall incorporate a thermal overcurrent tripping mechanism. Tests for the circuit-breaker include specified those in B.S. G.100 together with additional tests for endurance, overload, make and break capacity and high voltage.

Standards reviewed above may be obtained from the British Standards Institution, Sales Branch, 24 Victoria St., London S.W.1, at the prices stated.

Victoria's Progress Delayed

The Problem of Forward Finance must be Solved

LACK of finance, which has affected most electricity undertakings in Australia, proved a heavy setback to the State Electricity Commission of Victoria during the year ended June 30 last, according to the annual report. Against an original expenditure estimate of nearly £52 million for the financial year 1951-52, the Commission's loan-raising authority was restricted to £39 million, yet it was possible to raise only £32 million, of which £9 million was by the State Government's advances. Stressing that planning for large-scale electricity and fuel projects involves commitments over periods of up to five or six years ahead, the Minister in charge of electricity undertakings, Mr. K. Dodgshun, calls for the solution on a national basis of the problem of forward finance.

In view of the financial restrictions all efforts of the Commission are being concentrated on those works nearing completion. In the meantime the number of employees has been reduced by thousands, while plant and materials accumulated for the construction programme, valued at £3,750,000, are being sold.

New Consumers

However, the Commission remains undaunted in its efforts in other directions where capital restriction has not applied so severely. Noteworthy is the connection of 27,332 new consumers during the year under review—a record—two-thirds of the number being in country areas and including 2,381 farms.

Over 2,238 million units were sold—excluding the bulk supply to Victoria Railways, the increase was 2%, despite the quotas and other severe restrictions on the use of electricity. Domestic consumers alone accounted for over 547 million units and their average consumption amounted to 1,496 units. Income from all sources rose to £16,333,663, an increase of 31·1%, but expenditure too jumped by 29·5%, and a surplus of £209,210 resulted. Tariffs were raised by about 20% last July and should provide an additional revenue of £3 million per annum.

On the power side, the Richmond steam power station was brought into operation last August with one 38 MW set, and progress at Yallourn "C" and Newport power stations is being maintained as far as possible. Much of the work on the Kiewa hydro-electric projects has been deferred, but several of the regional power stations have been put into operation. These include two 830 kW diesel sets at Warrnambool, and six of similar size at Shepparton, while the "packaged" steam plants at Geelong and Ballarat are almost ready. The Commission hopes to install 200 MW of new generating plant by the winter of 1954, and altogether there is some 750 MW of plant on order for installation by the end of 1958—finance permitting!

Hydro Plant

The State Rivers and Water Supply Commission is to increase the capacity of the Eildon Reservoir from 306,000 to 2,750,000 acre ft and a new dam will be constructed. The Commission will then be able to construct a power station with an installed capacity of 120 MW comprising two 60 MW sets which are on order. The two existing turbo-generators will be reconstructed and installed in the new station and will contribute some 15 MW at times of peak demand during non-irrigation months.

Exploitation of the Murray River is also to be extended by increasing the capacity of the Hume reservoir from 1¼ million to 2 million acre ft and two 25 MW generators will be installed. Agreement has been reached between the State Electricity Authorities of Victoria and New South Wales on this project and the output and annual costs will be shared.

Provision has also been made for a hydro-electric development of 1,600 kW at the Cairn Curran Reservoir (near Malden), and the practicability of installing generating plant at other irrigation projects is being studied.

In the high voltage transmission field, work is proceeding on the Kiewa-Melbourne 220 kV transmission line and at the switching station at Mount Beauty. About one-quarter of the 630 towers required for this line have been completed and a further 50% are in course of erection. Clearing of the easement and track work is in progress for the new 220 kV Yallourn-Melbourne transmission line. At Clifton Hill, the new terminal station was placed in service during January 1952, and at Malvern Terminal Station the second 220 kV transformer bank (45,000 kVA) has been installed and is now operating on the intermediate voltage of 132 kV.

NEW LITERATURE

Electric Traction, Lifting and Conveying

edited by E. Molloy

EIGHTH in the Practical Electrical Engineering series, this book covers its field with the practical thoroughness characteristic of its forerunners. Its six contributors have combined to present a symposium in which each subject is handled to provide instruction without detracting from readability from the non-specialists outlook. Its profuse illustrations—there are 125 in all—add the required amount of variety. They give the whole a pleasing and attractive appearance, whilst serving as a balanced complement to the text.

A survey of modern electric traction introduces the reader to this wide field, whilst more detailed instruction is provided in succeeding chapters. These discuss railway equipment, with an emphasis on repair and maintenance, and in a similar vein trolleybuses and tramcars receive appropriate treatment. In the consideration of cranes, control gear receives primary attention, in which both a.c. and d.c. systems are discussed thoroughly, although ancillary equipment is not ignored. Electric lifting magnets receive more general treatment, before lifts and lift control gear are subjected to detailed consideration. The concluding chapter discusses the installation, powering and control of escalators. Published by Newnes, 164 pages, size 9 in. by 6 in. Price 17s. 6d.

D.C. Machines for Control Systems

by A. Tustin, M.SC., M.I.E.E.

BOOKS on control systems are commonly bedevilled by mathematical treatment that rather frightens the average engineer. There are plenty of equations in this present volume, but Professor Tustin's approach to a problem of growing importance has a style that makes matters easy for the power engineer. An instance is his first chapter, treating of the analysis of control system behaviour. It is shorn of much of the jargon of feedback analysis, inherited from the radio days, and there is a reassuring down-to-earth tone about many of the explanations. This acceptable approach is continued when the author gets down to his real business, which is a consideration of such machines as the Amplidyne, Magnicon and Metadyne, and of their application to industrial and other control systems. These topics are discussed in considerable detail, and there is an extension to torque motors and linear stroke motors. The book is undoubtedly a most important and, for the non-specialist, fortunate addition to the literature. Published by E. & F. N. Spon, 306 pages, 8½ in. by 5½ in. Price 50s.

Electric Fuses

by H. Lapple

PREPARED at the request of the E.R.A. fuse sub-committee, this summary of published information on electric fuses is a valuable addition to the library of the protection engineer. The author's wide experience illumines his factual review of the history of the fuse's continuous development from the 1920s onwards, with observations that set in their correct relation to commercial design the many technical details discussed. This critical survey is only part of the book, however. It is backed by a collection of 267 abstracts which summarise succinctly almost every important European and American paper on fuse performance and design published since 1920. The volume will be an invaluable introduction to any engineer who finds himself requiring background information on this disarmingly simple but important item of apparatus. Published by Butterworth, 173 pages, 8½ in. by 5½ in. Price 25s.

Examples in Electrical Calculations

PREPARED originally for naval personnel studying electrical technology, this collection of worked examples and typical problems is likely to provide a popular textbook for a far wider range of students. The subjects covered range from elementary a.c. and d.c. circuit theory up to the characteristics of dynamos, alternators, induction and synchronous motors and transformers. It is suggested in the preface that the volume covers the requirements of Ordinary National Certificate, but it seems that, while this is undoubtedly true, the excellently presented notes which precede each set of worked examples and numerical problems may well serve as valuable revision notes for those studying for higher examinations. Published by H.M. Stationery Office, 507 pages, 8¼ in. by 5¼ in. Price 17s. 6d.

Electric Motors and Control Gear

ed. E. Molloy

THIS well-illustrated addition to the publishers' "Practical Electrical Engineering" series provides a useful introduction to the construction and operation of some of the most common items of industrial electrical equipment. The articles included are for the most part descriptive, although there is a brief theoretical consideration of the induction motor, and they should prove extremely useful to factory engineers for reference purposes. A survey of a.c. motors is followed by a description of induction motor operation and control gear, of a.c. commutator motors and control, and of d.c. machines and associated equipment. There are final chapters of considerable interest on amplidyne control and on the selection and care of carbon brushes. Published by Newnes, 180 pages, 9 in. by 6 in. Price 17s. 6d.

Electrical Units

by E. Bradshaw, M.B.E., Ph.D., M.I.E.E.

IN this latest addition to the propaganda in favour of the M.K.S. system, Professor Bradshaw presents the practical advantages of the system in a succinct and attractive manner.

Essentially, his argument is addressed to teachers, though all engineers could benefit from a perusal of his pages. He devotes considerable space to the relation between the M.K.S. and other systems, and between the rationalised and unrationalised forms of the M.K.S. system. Of the latter choice, he favours rationalisation. A particularly interesting chapter considers the fundamental relationship $\mu_0 \varkappa_0 = \frac{1}{C^2}$ in relation to electrical units. Published by Chapman and Hall, 64 pages, 8½ in. by 5½ in. Price 9s. 6d.

BOOKS RECEIVED

Electricity Supply Engineering, edited by E. Molloy. General survey of distribution topics in publishers' "Practical Electrical Engineering" series. Published by Newnes, 164 pages, 9 in. by 6 in. Price 17s. 6d.

Power Station Work, edited by E. Molloy. "Practical Electrical Engineering" series. Published by Newnes, 164 pages, 9 in. by 6 in. Price 17s. 6d.

Power Transmission Engineering, edited by E. Molloy. "Practical Electrical Engineering" series. Published by Newnes, 180 pages, 9 in. by 6 in. Price 17s. 6d.

Photo-Electric Multipliers, by S. Rodda. Account of development and field of use for university students and physicists. Published by Macdonald, 180 pages, 8½ in. by 5½ in. Price 22s. 6d.

Electrical Measurements—Part 2, by D. Karo, A.C. measurements with special reference to bridge circuits and calculation of errors. Published by Macdonald, 343 pages, 8½ in. by 5½ in. Price 30s.

Applied Electricity, by H. Cotton. Textbook for Part I of London B.Sc.(Eng.). Published by Cleaver Hume, 482 pages, 8½ in. by 5½ in. Second edition, price 18s. 6d.

The Use of Welding In Steel Building Structures, prepared by a committee of the British Constructional Steelwork Association, gives guidance on the design of metal arc welding of steel building structures. Under nominally static loads, these structures are those designed as simple frames of mild and high tensile steels. B.C.S.A. publication No. 6, published by British Constructional Steelwork Assn., Artillery House, Westminster, S.W.1. *Gratis.*

MACHINE TOOL SAFETY

DESPITE the ingenuity of safety conscious machine-tool designers, it is difficult to devise safety measures which are completely foolproof. Neither is it always possible to guard against carelessness on the operator's part, which can constitute a serious risk of danger, more particularly on starting.

Recently a starter control has been developed in an attempt to minimise still further risks from these sources. Simple in operation, the "Prestoo safety device" is aimed at ensuring that both hands are away from the machine at starting—by providing two push-buttons which must be pressed simultaneously. Designed by Alfred Herbert, Ltd., the control incorporates an electronic timing device which ensures that unless the two buttons are pressed together or within one or two seconds of each other, the starter will not operate.

The buttons are situated some distance from each other to make it impossible for the operator to span them both with one hand only. Moreover, other possibilities for cheating are stated to be remote. Should buttons be pressed separately, or one jammed or intentionally blocked, the control is rendered inoperative and remains so until reset or the machine switched off completely. Normally designed for 220/240 V, 50 c/s, single-phase, it can be made for other voltages if required, and adapted where necessary for multiple station operation.

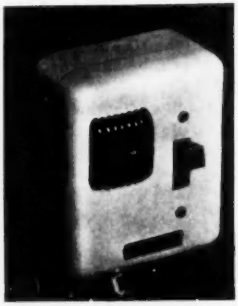
Operation of this novel safety control clearly requires both hands. Here it is being used on a Herbert-Reed-Prentice diecasting machine

The BUYER'S *Column*

Arrow Indicating Control Units

FURTHER additions to their range of switch units have been announced by ARROW ELECTRIC SWITCHES LTD., Hanger Lane, Ealing, London, W.5.

These are based on the design of the company's original units but have been modified to take standard lamps and are fitted with a large square-type lens.



The restyled Arrow unit

The tumbler pattern (on-off d.p.) is rated up to 30 amps at 250 V a.c. d.c., and is provided with a red bullseye for the standard 15 W pygmy sign lamp or alternatively a plain lens where neon lamps of small wattage are used.

Rotary units are available with many improved features, patterns available are 15 amp and 20 amp series-parallel d.p. and 15 amp and 20 amp on-off d.p.; in all cases these are finished white with ruoy lens.

Claude Lyons B.A.V.R. Stabilisers

AN introduction by CLAUDE LYONS LTD., 180-182 Tottenham Court Road, London W.1, the B.A.V.R. automatic voltage stabiliser is claimed by the makers as an entirely new pattern of a.c.-voltage stabiliser.

It possesses many advantages which will be welcomed by those engaged in laboratory work who require a regulator which operates independently of frequency changes of a commercial nature and under wide load limits. The degree of stabilisation is claimed to be very high.

Externally the unit is neat in an aluminium case finished in grey stove enamelling fitted with ventilation louvres and provided with rubber feet (to avoid damaging polished bench surfaces, etc.), three point input and two point output plug are provided, the latter for connection to the load. A special carrying handle is supplied without extra charge if requested.

The control unit is a magnetic amplifier, the inductance of which varies with the d.c. passed through control coils. Stabilisation is achieved by monitoring the output side and regulating automatically the d.c. component, so as to adjust the a.c. output voltage to constant within precise limits.

On testing the effects of frequency variation between 47 c/s and 52 c/s it was found that the output voltage does not change by more than 2%: the actual degree of stabilisation remains at 0·15%. The effect of widely differing load is that the output voltage around which stabilisation occurs is lowered very slightly by increasing load.

Types available include BAVR-200 (200 VA), £52 10s.; BAVR-500 (500 VA), £57 10s., and BAVR-1000 (1,000 VA), £62 10s.

Gripper Handlamp Discount

AS from February 1, 1953, all wholesale discounts on the complete range of "Gripper" Handlamps marketed by BRITISH CENTRAL ELECTRICAL CO. LTD., 6-8 Roseberry Avenue, London, E.C.1, have been reviewed.

Pocket Oil Pen

A POCKET oil pen has been recently introduced into this country from Denmark by ELKAY ELECTRICAL MFG. CO. LTD., of 42 Woburn Place, London, W.C.1.

It is designed for dispensing one drop of light machine oil at a time on pressing a stud at the top and is therefore an ideal tool for engineers, mechanics, electricians and handymen. It is provided with a cover and a clip for the pocket which makes it particularly suitable for maintenance technicians.

Another advantage is the visible oil tank which is easily refilled by unscrewing the cap at the top, and there are alternative colours, either red or black. The retail price is 9s. 9d. and leaflets are available.

This oil fountain pen clips into the pocket

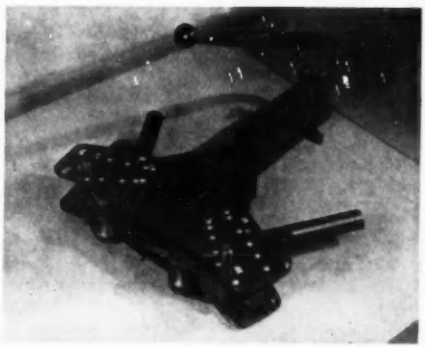
Tubela Changeover

AS from February 26, the "Tubela" range of tube-bending machines will be distributed through normal trade channels instead of through the former sole distributors Messrs. Lawler Ayers and Co., Ltd.

Announcing this TUBELA ENGINEERING CO., LTD., 6 Furze Street, London, E.3, say that many reasons necessitated this change, but the principal reason was the need for establishing efficient servicing facilities and this could only be effected when the makers were actually in touch with the trade.

Most interesting recent addition to the company's range is the extreme bending unit, designed for the H.3 machine and facilitating the bending of ½ in. to 2 in. steam and gas tubes to 180°.

The H.3 unit itself operates by hydraulic pressure and exerts a pressure of up to ten tons under normal working conditions on tubes of ½ in. to 3 in. diameter.



Courtney Pope Emblems

DECORATIVE panels and clip-on lamp caps are included in the range presented by COURTNEY POPE LTD., Amhurst Park Works, Tottenham, London, N.15.

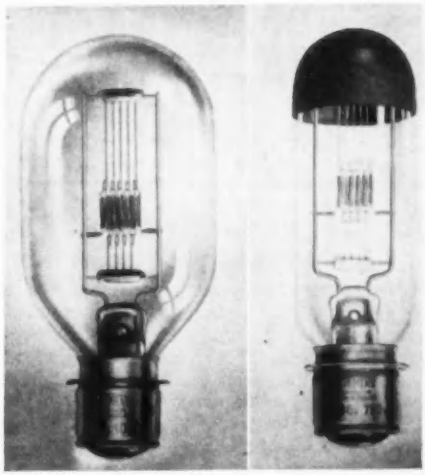
The panels are 1 ft. 9 in. square, stove enamelled with colour to choice supplied in the following varieties :—

(a) Royal Cypher, pattern pierced and illuminated from behind by tungsten lamps; 2, Royal Cypher sign written with superimposed neon letters to any colour required; or 3, Royal Cypher with pygmy lamp outline.

(b) 1 ft 9 in.-square stove enamelled panel, colour to approval featuring Crown. Supplied in alternatives as detailed above.

(c) 1 ft 9 in.-square stove enamelled panel, colour to approval, supplied with decorative motif of Fleur-de-Lys, English Rose or Scottish Thistle motifs here supplied only as pattern piercing with tungsten strip lamp lighting only.

The decorative clip-on caps are bellshape caps which fit completely over the glass envelopes of standard tungsten lamps. These are pierced on the head with rose and thistle emblems.



These new projector lamps by Siemens take 200/250v supplies direct from mains

Projector Lamps for 200/250 V

THREE new projector lamps, for operation on 200/250 V—representing an important technical advance—have been introduced by SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames Street, E.C.4. Their development follows much experimental work at the Siemens research laboratories at Preston, in conjunction with Aldis Bros. The familiar form of filament construction used in many projector lamps is employed in order to present to the optical system a uniform arc of light of the smallest possible dimensions. Until now these lamps have been available only in the 100/130 V range because filaments for use on 200/250 V would of necessity employ a finer gauge of tungsten wire for the same wattage, and serious problems of stability have been encountered. Now Siemens have introduced lamps of 500 W, 750 W and 1,000 W for operation at 200/250 V, thus eliminating the need of a stepdown transformer and effecting a considerable saving in weight and cost of the complete projection apparatus.

TRADE PUBLICATIONS

COILS.—Recently published by Oliver Pell Control Ltd., Cambridge Row, Burridge Road, Woolwich, S.E.18, the Varley Coil Designers Handbook embodies the experience of the company who have been coil winders to the trade for over 50 years.

TESTING SETS.—The "Ducter," the low resistance testing set produced by Evershed and Vignoles Ltd., Acton Lane Works, Chiswick, London W.4, and its operation is fully described in an instruction book issued by the company.

The WEEK in NEWS

No P.T. on Electrical Storage Heaters

EQUIPMENT RE-CLASSIFIED AS NON-DOMESTIC

FOLLOWING persistent negotiations over the past two years, makers of electric storage space heaters have now succeeded in gaining for their products exemption from the 100% purchase tax imposed on them. The two companies mainly concerned, Aberdare Electric Co. Ltd., and the General Electric Co. Ltd., have both received official notification to this effect from the Commissioners of Customs and Excise. The decision takes the form of a reclassification. The equipment is now to be considered as non-domestic and consequently not liable to tax. In a letter to the manufacturers, Customs and Excise Authorities stated that they are now prepared to regard the heaters as equipment to be used entirely for industrial premises, but have pointed out that hotels, boarding schools and other premises where people live are termed as domestic establishments.

Several approaches have been made to the Government department concerned, mainly, it is understood on two grounds—firstly that the apparatus consumed electricity during off-peak hours, and secondly that such installations were in the interests of national economy. The two main heaters retail at £16 and £12 10s. 8d. and were subject to taxes of £13 5s. 2d. and £10 13s. respectively.

ITALIAN INVITATION TO FLOOD VICTIMS

LORD CITRINE, chairman of the B.E.A., last week received a generous offer from Signor Piero Ferrerio, his opposite number with the Italian National Association of Electricity Supply Undertakings. In a cablegram, the Italian chairman offers to accommodate 50 boys (aged between 6 and 12) from flooded areas in one of the Association's hostels in Italy. We understand the offer has been passed on to the appropriate authorities.

International Congress on Mechanical Engineering

WE hear that the fifth international Mechanical Engineering Congress is to take place in Turin between October 9 and 15, which are days coinciding with the Salone Internazional della Tecnica. The theme of this year's Congress is production and assembly methods for components in mechanical engineering. This will cover examination and comparison both from the technical point of view and from the standpoint of production costs. Various methods available for the design and manufacture of components will be considered. A number of visits are being arranged for delegates. Those desiring further particulars should write to British Engineers' Association, 32 Victoria St., S.W.1.

RADIO & TV SALES STILL INCREASING

DECEMBER sales of both radio and television sets showed considerable increases over those of the preceding month according to the latest R.T.R.A. figures just issued. The decline in radio sales during November has been recovered with sets to spare. The average number of radio sets sold per shop during December was 10·24, a rise of 2·71 over the November figure. Similarly TV sales showed an increase of 2·4, the December figure being 15·35. Comparative figures for the same month in 1951 were 11·16 for radio and 15·08 for television sets.

Minor Changes in Iron and Steel Prices

ALTERATIONS in iron and steel prices were announced last week by the Minister of Supply. All are of a minor nature. Increases in scrap prices, resulting from rises in transport charges, range from 11d. to 1s. 11d. per ton. Average price previously was about £6 per ton. Maximum prices of a small number of iron and steel products have also been increased, and extra charges for delivery of certain types of steel to places distant from the steel works is permitted. The relevant orders became effective on February 11.

The First Half-Century

During the discussion on the manufacture and design of electrical machinery at the I.E.E., Mr. Barker (of the Brush) spoke of the future of the turbo-dynamo, and volunteered facilities for combining the steam turbine with dynamos by any manufacturers who desired the combination. (I wonder what Messrs. Parsons will think of Mr. Barker's generosity?) Dynamo builders had been much hampered by difficulties in getting steel for the yokes of their machines, and had put in cast iron for the sake of early delivery.—*From our issue of February* 19, 1903.

TWO EXHIBITIONS IN PERTH NEXT MARCH

ONCE again the North of Scotland Hydro-Electric Board is organising two large exhibitions. It will be recalled that last year the Board staged two large-scale and most successful exhibitions at Inverness, one dealing with electrical economy and the other with electricity in agriculture. This year Perth is to be the venue, and the shows are to be entitled the Energy Electrical Exhibition and the Agricultural Electrical Exhibition. The former, to take place between March 10 and 14, will comprise a wide range of electrical equipment, from the simple domestic appliance to large industrial plant. Attention will be drawn particularly to the economy and ease resulting from the use of electricity, and experts will be asked to give advice on all types of appliances. Feature of the exhibition will be an all-electric house which is actually being lived in during the show.

The Agricultural Exhibition will be held at the Drill Hall (Tay Street) between March 13 and 16, where about 30 exhibitors will show equipment suitable for use on the farm. It is expected that the combined shows will house about 3,000 exhibits, with a total value of over £10,000.

E.D.A. SUGGESTS TWO CORONATION WINDOW DISPLAYS

DISPLAY personnel at electricity showrooms can have their coronation problems solved if they care to take advantage of two suggestions prepared by the exhibition department of the Electrical Development Association. One has been designed for large and imposing centres and the second is suitable for small windows. Both provide for a central portrait of H.M. the Queen with space for a goodwill message. The remainder of the displays are made up of drapes, banners and plaques, and also mounts for topical news photographs. A service is being organised whereby the photographs can be replaced by those of current interest—E.D.A. undertaking to despatch new pictures to the showrooms. Full details of the suggested displays may be had from the Association.

Permanent "Fair" in Newcastle?

A SUGGESTION made on Tyneside that a permanent exhibition be set up in Newcastle, is receiving a deal of publicity locally. It is understood that the proposal is for the acquisition of a building which would become a shop window of industry —both large and small—and that for a part of the year an exhibition on the lines of the B.I.F. should be staged. The idea has been put forward by a local manufacturer who is also an officer of the local Chamber of Commerce. Local authorities would be asked to obtain the building. Early reaction to the idea appears to be that firms making or selling smaller commodities and consumer goods are in favour of such a scheme, while manufacturers of heavy equipment are less enthusiastic.

Australia to Allow £A50m More Imports

THE possibility of Australia allowing more imports into the country, reported in our February 12 issue, has become a fact. It was announced on Monday that during the next financial year a further £A50 million worth of goods would be imported. The Prime Minister has stated that while most types of imports would be included, the new policy would not extend to dollar or Japanese goods. Details of the changes were being worked out and should be made known shortly.

Major Fault at Portobello

ELECTRICITY supplies to nearly the whole of Edinburgh and surrounding districts failed on Friday following a technical fault at Portobello power station. It was stated at the headquarters of the S.E. Scotland Division of B.E.A., that there was a flash-over of some of the h.v. insulators, causing both transformers connecting the station to the grid to be automatically switched out. Probable cause of this was stated to be the collection on the insulators of salt spray.

Last week we reported Mr. N. G. Lethlean's paper to the Royal Society of Edinburgh on experiments carried out to control the movement of salmon and trout near hydro-electric schemes. Our illustration shows workmen wiring electrodes of the fish-screen at Dunalastair Dam. Electric pulses are transmitted through the screen to direct fish into the fish-pass

A corner of the Normandie Restaurant, Bentalls Ltd., showing the specially designed silver light lamp

CEILING FITTING FOR RESTAURANT

A NOVEL central ceiling fitting was specially designed and manufactured by Courtney Pope (Electrical), Ltd., in an effort to achieve the desired period impression in the Normandie Restaurant of Bentalls, Ltd., Kingston. The result has been a creditable blending of contemporary design with period effect. The fitting comprises 12 tubular arms branching from an inverted crown, through a central sphere, over the opposite side of the crown, and out into "space." At the end of each arm there is a cone into which have been fixed bare 60W lamps. The whole has been made in brass and finished in ivory. Wall brackets of similar design have also been provided. In addition there is the cornice lighting running round the entire perimeter of the restaurant. Illumination sources in this instance are 4-ft 40-W fluorescent tubes. The decorative pelmet has also been finished in ivory colour to match the other fittings. The actual installation was carried out by the store's own electrical staff.

DOCUMENTARY FILMS

New Colour Film on Mechanical Handling

MANY industrialists will probably have seen the documentary film, "Mechanical Handling," released in 1948. We note that a supplement to that production has now been shown for the first time by the Mechanical Handling Engineers' Association. Made in colour, it is entitled "Conveyors as Your Servants," and is available on loan free of charge. The new film explores some of the applications of mechanical means for moving goods, but although the range of uses was necessarily limited, viewers will undoubtedly be able to visualise possibilities in their own methods of production.

Making Valves and TV Tubes

FOLLOWING the release of the Hoover cleaner film (see February 12 issue), and that on mechanical handling mentioned above, yet a third documentary has been produced recently. This was made for Mullard Ltd., and depicts the most important phases in the manufacture of radio valves and television picture tubes. It traces the process through the making of glass, fine wire and components, to the assembly, sealing and testing stages. It is entitled, "It's a Good Sign," and is scheduled to be shown at a series of meetings being arranged by Mullards, together with the R.T.R.A., Scottish Radio Retailers Association and Institute of Practical Radio Engineers, and also to the company's employees. Later, it is to be adapted for screening in technical colleges and schools.

Films in Schools

THE importance of films in school curricula for the teaching of electrical subjects was emphasised by Mr. Philip Honey of E.D.A. in a lecture to the Leeds Educational Film Society last week. The production of these films could not be left to educational authorities, he said, especially when the electrical industry not only had the means of producing them, but also the background of practical knowledge. Mr. Honey reminded his audience that E.D.A. had made nearly 30 electrical educational films and more were to be made in the future. At present about 1,300 films were being loaned to schools, technical colleges and other organisations, by the Association every month, and this in addition to the 2,000 or more copies sold both at home and abroad.

OFFICIAL PUBLICATIONS

IRON AND STEEL PRICES ORDER, S.I. 169. H.M.S.O. 6d.

IRON AND STEEL SCRAP (AMENDMENT) NO. 1 ORDER, S.I. 170. H.M.S.O. 2d. (See page 362.)

N. OF SCOTLAND H-E. BOARD CONSTRUCTIONAL SCHEME NO. 68) CONFIRMATION ORDER. ALSO CONSTRUCTIONAL SCHEME NO. 69 CONFIRMATION. Both from H.M.S.O. 2d. (See page 368.)

BRITISH STANDARDS

B.S. 1376: *Colours of light signals (Revision)*; B.S. 1928: *Lateral-cut gramophone records and direct recordings*; B.S. 1924: *Aluminium filler alloys for brazing*; B.S. 2G.121: *Hand-operated circuit-breakers for extra-low voltage d.c. systems in aircraft*; B.S. G.142: *Heavy duty electro-magnetically operated, single pole circuit-breakers for extra-low voltage d.c. systems in aircraft*; B.S. 1945: *Fireguards for heating appliances*. (See page 340.)

PLASTICS MOULDING. *British Productivity Team Report*. H.M.S.O. 5s. 6d. (See page 365.)

Objections to Lighting Zebra Crossings

THE support of all of London's boroughs is being sought by Westminster City Council, who, as reported in our February 5 issue, are opposing the installation of flashing beacons at pedestrian crossings. A special sub-committee met last week to discuss the lighting of zebra crossings, which is to be raised at the full conference of the Metropolitan Standing Joint Committee early next month. The Minister of Transport has indicated that the illumination of crossings was likely to be made the subject of a compulsory order.

Westminster are of the opinion that more extensive experiments for accentuating crossings should be undertaken before they could feel justified in proceeding with the scheme. One of their main objections is the considerable additional expense which will be imposed on local authorities. Another is that flashing lights will tend to distract motorists' attention instead of arresting it. On the question of cost, the Ministry's original estimate was £40 per crossing or £60 if there was a central refuge. Westminster have stated, however, that it will probably cost about £18,000 to illuminate 103 crossings. It is understood that only a few local councils have so far installed the new system, Lewisham being the notable borough in London.

Plastic Moulding in America

SAFETY practice in the American plastics moulding industry would appear to create conditions lower in standard than those accepted in Britain. Although this conclusion may be drawn from the British Productivity Team's Report on Plastics Moulding in America, it is stated that Americans demand fully safety-conscious operators.

One of the more common applications of electricity is shown by the current practice in thermoplastics, where infra-red heating is used. Infra-red energy is also used for pre-heating thermosetting materials, but h.f. heating is preferred, due to shorter curing times attained with this method.

Among new plastic materials noted by the team were moulded nylon, and elastomeric grades of p.v.c. stated to have up to 100% elasticity. In thermo-setting plastics is noted a special phenolic material which acts as a permanent magnet.

Course on Wages and Personnel

A SPECIAL five-day residential course for personnel officers and others responsible for job evaluation, negotiating changes in wages, pension and profit-sharing schemes, and day-to-day problems of wage administration is being arranged by the Institute of Personnel Management. The course is designed for those who already have some knowledge and experience of industry, management and human relations, and is not intended as initial training. It will take place at the Richmond Hill Hotel, Richmond, between March 8 and 13. The Institute's Courses Secretary is at Management House, 8 Hill St., W.1.

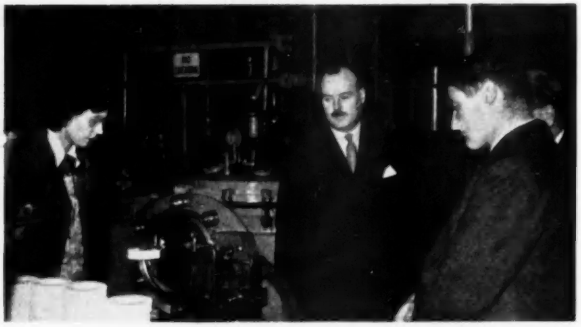
ELECTRICITY IN COAL MINES

TOTAL electrification of a colliery sometimes closed an outlet for inferior fuels and in those cases there might be a case for a pithead power station, said Mr. E. H. Browne, N.C.B. director-general of production, in a talk to the Yorkshire Branch of Colliery Managers Association last weekend. The Board and the B.E.A. had agreed to share the erection of those stations, he said. There was one now being planned in Ayrshire and another in Yorkshire. Referring to the useful field to be developed in automatic electric winding, Mr. Browne thought too many accidents occurred due to human errors. This was a case where safety and economy could be developed by automatic control.

New Technical Institute

A NEW Technical Institute was formally opened at Barnstaple, N. Devon, last week. Work began on the College early in 1950 and so far two blocks of buildings have been completed. Among the numerous facilities available are well-equipped electrical workshops.

If you have £250,000 in pound notes you don't want, there is now an electrically-operated destructor which will burn that amount to ashes in a day. Made by the G.E.C., the machine is so constructed as to guard against possible unauthorised extraction. Total rating is 6 kW. Igniting elements are controlled by a time switch and a hand-operated rotary switch



Capt. R. E. D. Ryder, M.P. for Merton and Morden, is seen here watching a demonstration during his recent visit to the Wimbledon factory of Foster Transformers Ltd. Capt. Ryder had previously expressed his desire to see more of the industrial activities of his constituency

A Busy Time at Horsley Towers

A GARDEN fete and an art show are among the activities scheduled to take place at Horsley Towers, the B.E.A.'s training establishment near Leatherhead, Surrey. The fete will be held on June 27 and will be in aid of the E.I.B.A. As from last Monday a collection of paintings and drawings by well known artists are on show at the establishment. They will be for recreational discussion and talks on art appreciation, and will be replaced in about three months' time by a completely new set of paintings and drawings.

KAFUE AND KARIBA

A DESCRIPTION of the Kafue Scheme was published in our issue of February 12, in which we referred to Sir William Halcrow and Partners as being the consulting engineers. We are, however, informed that no consultants have as yet been engaged. The panel of engineers responsible for the report, and formed on the initiative of the Central African Council, consisted of Sir William Halcrow (Sir William Halcrow and Partners), Mr. H. J. Gourley (Binnie, Deacon and Gourley), Mr. C. H. Pickworth (Preece Cardew and Rider), and Mr. Geoffrey Kennedy (Kennedy and Donkin). We regret any misapprehension which might have arisen due to this error.

I.E.E. DINNER

ANNUAL dinner and dance of the North-Eastern Centre of the I.E.E. took place last Thursday, when over 200 members with their wives and guests, braved the weather to attend. Toast of the Institution was proposed by Dr. C. I. C. Bosanquet, rector of King's College, who spoke of the universities' important contribution to the industry in the training of student engineers. The need for greater numbers of trained engineers was emphasised by Col. B. H. Leeson, replying to the toast.

FALKS' NEW SHOWROOM

A FORMER restaurant in Commercial Road, Southampton, acquired some two years ago, has been redecorated and was opened recently as a showroom for Falk, Stadelmann and Co. Ltd. The rejuvenated premises comprise a modern showroom displaying all kinds of lighting fittings, cables, switchgear, and domestic appliances, a trade counter, opened last October, and a large warehouse. It was designed to serve the South Coast area, including Hampshire and the Isle of Wight. Manager of the new showroom is Mr. J. Pitfield.

Special Rates for Coronation Power

CHARGES for electricity supplied for Coronation illuminations by local authorities and others were announced last week by the South Western Electricity Board. A flat rate of 3s. a week per kW will be charged for supplies taken during June and July. For the large type of installation used over longer periods, a charge of about 1.65d. per unit (rather better than the standard commercial tariff) is being offered. The Board's chairman, in a letter to Mr. G. Howard, M.P. for St. Ives, went on to explain that area boards had generally agreed that the cost of connection and eventual removal of temporary points would be charged to local authorities or other consumers. Charges, he wrote, would be at the most appropriate commercial rate.

NEWS IN BRIEF

An American order for 20,000 record changers (worth £100,000) has been placed with the Londonderry factory of Birmingham Sound Reproducers Ltd.

Ex-Johnson and Phillips Association will be holding its sixth annual dinner and reunion at Grosvenor House, Park Lane, London, on March 7.

Annual dinner of Birmingham Electric Club will be held at the Grosvenor Room on March 6.

Between 1946 and 1951 direct exports of electronic equipment have risen steadily from £1m. to £6m. a year. Though Customs figures for 1952 are not yet available they are expected to exceed £8m., while total for the whole radio industry is expected to be about £24m.

Chairman and directors of London Electric Wire Co. and Smiths Ltd. entertained their staff to a dinner and cabaret recently.

National Smoke Abatement Society has just published in booklet form the proceedings of last year's Portsmouth conference.

Questions in Parliament . . .

Breadalbane Project

The Secretary of State for Scotland gave some further details of the North of Scotland Hydro-Electric Board's Breadalbane project last week. The expected load factor of the works would be about 40%, and the anticipated saving in coal at a conversion figure of 1·31 lb per unit of electricity generated, would be about 180,000 tons a year, he said. Replying to further questions, Mr. Stuart stated the capital cost per MW to be installed would be about £170,000, or £180,000 if the cost of transmitting power to the grid was added. Work on the scheme was expected to start this year; electricity would be produced in about four years' time, and the project should be complete in about 1960.

Storm Damage in Scotland

In the course of a statement on damage in Scotland caused by recent storms, Mr. J. Stuart remarked that the North of Scotland Hydro-Electric Board had repaired most of the damage done to their installations. This damage was estimated at not more than £10,000. The statement was made on February 10.

Trade with China

A number of electrical commodities have been included in the list of types of machinery the China National Import-Export Board intended to purchase in the U.K. Giving details in a written answer last week, Mr. H. Strauss named (among others) generating sets, high pressure steam valves, electrodes for arc furnaces, tube welding machines, deep hole drills, dynamometers, mercury rectifiers, magnetic separators, various types of relays, refrigerators, spares for 11 MW turbines, and various items of equipment for power stations.

Brighton's Booster Station

Mr. D. Gammans told the House last week that the TV booster at Brighton had been sanctioned as an experimental station and was being built as such. The cost would probably be under £10,000.

Solid Fuel Appliances

Answering questions on the production of solid fuel burning appliances, Mr. G. Lloyd said manufacturers were already at work on designs based on achieving a room efficiency of 40%. He added that the so-called room efficiency standards had not yet been evolved, but he had been advised that it might be possible to relate them to the present test bench standards. These were being raised and revised, and when this had been done, the question of making appliances could be decided.

Tax on Fuel Saving Appliances

The Chancellor of the Exchequer was asked last week about financial incentives for the installation of domestic solid-fuel burning appliances. The House was told that only those parts of the Ridley Committee's recommendation which related to credit policy and tax liability concerned the Chancellor. In the former instance he was not convinced that its merits outweighed disadvantages, and as regards the latter, the budget could not be anticipated.

Electricity Tariffs

The Minister of Fuel and Power said last week that the review of new tariffs would take some time, and he had not yet received a report.

Atmospheric Pollution

In a written answer last week, Mr. Molson explained that the Atmospheric Pollution Research Committee was concerned with the collection of data and with research into measurement and prevention undertaken by the Fuel Research Organisation of D.S.I.R. The committee had met twice during the past year. Mr. Molson listed the members, who include Dr. H. E. Crossley of the B.E.A., and Prof. R. J. Sarjant, professor of Fuel Technology at University of Sheffield. The past year's cost of research in the field of atmospheric pollution was about £33,000.

Thermal Storage Heaters

In reply to a question from Mr. Philips Price on Monday, the Minister of Fuel and Power said that he was discussing with the B.E.A. whether alterations in general tariff policy could give further encouragement to off-peak consumption. Mr. Price had asked for a general direction on the matter to encourage thermal storage heaters, but the Minister, while agreeing that these were very promising, did not think there was occasion for such a direction.

Pension Arrangements

On Monday, Mr. Geoffrey Lloyd, replying to two questions about the pension rights of ex-municipal employees in the electricity industry, said that he was now prepared to agree to amendments to pension schemes so as to give benefits comparable to those given under the Pensions (Increase) Act, 1952. When made the scheme would apply retrospectively to October 1, 1952. The scheme would not apply to former employees of companies, as distinct from local authorities.

Private Generation

Replying to Mr. Nabarro, the Minister of Fuel and Power said that the aggregate installed capacity in megowatts of privately owned industrial generating plant was not known at present. He hoped, however, to obtain such a figure in "some months' time," as a result of current census of production questionnaires. A joint committee of the B.E.A., F.B.I. and the National Union of Manufacturers was at present considering the technical requirements of working private generators in parallel with the public supply.

Electric Supply News . . .

Argyll

An extension of the North of Scotland Hydro Electric Board's Glen Lussa project in Argyll, has been agreed to by the Secretary of State for Scotland. The extension will increase the annual output of the generating station in Glen Lussa from 8½ million units to 10¾ million units at a capital cost of £310,000. Water will be diverted by tunnel from the upper tributaries of the River Barr into the reservoir created under the existing Glen Lussa scheme. The Board has also just received formal confirmation of its scheme to extend the existing Cowal hydro-electric scheme. The headwaters of a number of small streams flowing into Loch Riddon are to be diverted through a pressure pipe to the existing generating station at the head of Loch Striven. This will increase the output of the power station from 14 million units to 18,600,000 annually. Cost of this scheme is estimated at £350,000.

Derry

Strong representations are to be made by Derry Rural Council in a further effort to obtain a supply of electricity for the rural area lying west of the River Foyle. At the recent meeting of the council it was stated that more than 700 people have put down their names to get electricity from across the border. The clerk, Mr. W. A. M'Cahon, said the Eire Electricity Supply Board would not give supplies to people on the Northern Ireland side of the Border without the permission of the Electricity Board for Northern Ireland. The latter Board has stated that financial considerations outside its control had curtailed electrical development. The Board wanted to meet all demands, but were obliged to give priority to places which would not put an unduly heavy burden upon their undertaking, first priority being given to supplies likely to yield an economic return.

Easington (Durham)

The North-Eastern Electricity Board has made arrangements for taking over from the National Coal Board, the network supplying Murton, Dalton-le-Dale, and Hesleden. In order to improve the supply it is proposed to build several new substations with h.v. feeders, construct new l.v. lines, and reconstruct existing l.v. lines. The improvements will take nine months to carry out.

Eire

Four small electricity generating stations, to be fired with privately produced hand-won turf, are to be erected in Eire, the Minister for Industry and Commerce has announced. The stations which, it is hoped, will be in operation in about three years time, will be located near Kells, South West Kerry; near Miltown Malbay, West Clare, at Screeb, near Maam Cross, Connemara; and near Dungloe, West Donegal. There has for long been a considerable industry in these areas for the turf which has been dug out by the local population, and these new stations will now provide an assured market for the surplus turf. In addition these new stations will facilitate rural electrification in areas which, owing to their distance from the existing transmission system, might otherwise be considerably delayed. The capacity of these stations has not been divulged, but an indication can be gained from the fact that each will require a minimum of 30,000 tons of turf annually. The Electricity Supply Board's Allenwood power station, which has two 20,000 kW generating sets, needs about 180,000 tons of turf per annum.

Northumberland

Miners at Mickley Colliery are seeking an amendment to an agreement with the National Coal Board whereby electricity will be available at the miners' houses for 24 hours a day instead of from dusk to dawn as at present. More than 40 years ago, the miners made an agreement with the then colliery owners under which electricity was supplied at a cheap rate from dusk to dawn from the colliery network. The National Coal Board has continued this arrangement, but the miners now want the supply to be continuous so that they can make use of other electrical appliances. The N.C.B. is prepared to agree if the miners make a reasonable offer, it is stated, but it has been pointed out that the present wiring will not carry loads from washers, kettles, cookers, etc. The miners are charged 5d. a week for the use of a 100 W lamp, 7d. for a more powerful light, and 3d. for the current used by radio sets.

Northern Ireland

Future schemes of rural electrification in Ulster would have to pay their way, Mr. A. W. Ferguson, chief administrative officer of the Electricity Board for Northern Ireland, stated at a public meeting in Boardmills, Co. Down, recently. He was addressing a meeting which had been called locally to press for an electricity supply for the district. The Government had passed schemes up to a total of £3,500,000 on rural electrification and, of that, £2,000,000 had been spent, he said. This year, although the Board had proved that it was unremunerative it proposed to spend another £500,000. It was proposed to wipe out the whole of that unremunerative expenditure by the end of 1955. Mr. T. G. Christie, chief engineer of the Board, said that Boardmills would have to produce about five times the revenue which the survey had shown if the supply was to be economic. The district was unfortunate because it had no industries to help them. When a suggestion was made by a member of the audience that there should be a series of small schemes instead of a large comprehensive scheme, Mr. Christie said that it was a sensible suggestion.

Southern

Details of the standard commercial tariffs to be introduced in April have now been released by the Southern Electricity Board. As we stated on January 29, these new tariffs have been fixed at a level to yield approximately 12½% more revenue. There is a block tariff with a unit price of 5½d. p.a. applying to an initial block of units, the number of which depend upon the lighting, heating and power installation at the premises, with a secondary rate of 1d. p.a., for all in excess. Alternatively there is a demand tariff for consumers taking over 20 kVA. For these, the first 20 kVA of m.d. is charged at £8 10s. per kVA per annum, and each kVA over at £6 10s. p.a., with a unit charge of 0.6d, together with a coal clause.

LIGHTING SCHEMES

Dundee.—The Lighting Committee has approved in principle a scheme for the conversion of six miles of tram route street lighting to electricity at a cost of about £10,000.

Harrogate.—It is proposed to convert 600 street lamps to automatic operation at a cost of £8,440.

Keighley.—T.C.'s application for loan sanction of £11,481 for improved lighting in Town Hall Square has been rejected by the Ministry who have indicated they will consider a more modest scheme. A revised scheme costing £5,370 has been prepared.

Northallerton.—The U.D.C. has been recommended to approve a £2,179 street lighting scheme for the older areas of the town.

Northampton.—T.C. propose to proceed with the second stage of the new street lighting scheme (estimated cost £9,780) as soon as possible.

Portland.—U.D.C. to apply for consent to borrow £5,706 for the conversion of street lighting from gas to electricity.

Stone (Staffs).—The surveyor is to prepare a full scheme of street lighting proposals for the whole of the rural district.

Stirling.—T.C. is receiving M.o.T. approval for £11,985 scheme for converting street lighting from gas to electricity.

Thornaby-on-Tees.—T.C. is to install electric lighting in selected streets in the town.

Company Activities . . .

Murphy Radio

Treasury permission is being sought for the issue of new capital. It is proposed to issue 200,000 £1 Preference shares to rank with the existing 5½% Preference, and 800,000 5s. Ordinary shares. The Preference, it is expected, will be the subject of a placing, but the Ordinary will be offered to existing Ordinary shareholders. Resolutions to raise the authorised capital to £1,750,000 will be the subject of an extra-ordinary meeting on February 27. The directors refer to the need for more working capital in view of business expansion and increased costs. There is a further £50,000 debenture debt owed by subsidiaries which must be met by March 31. In addition, the company is participating in the proposed amalgamation of the t.v. relay service business, details of which we noted on January 22, and for which Treasury sanction is being sought.

R. B. Pullin & Co. Ltd.

A sharp rise in profits for the year ended September 30 last is reported by this concern of electrical instrument manufacturers in its preliminary statement. The group profit is £89,265 which is an increase of £22,100 over the previous year's total. The dividend is again 15%.

John Summers and Sons

The group trading profit of this firm of iron and steel manufacturers who specialise in transformer and armature sheets, amounted to £3,572,782 for the year ended September 27, last. This compares with a total of £2,851,830 for the previous 39 weeks (which works out at about £3,762,408 per annum). The distribution for the year is 8½%. Referring to the Shotton Works development scheme, the directors state that certain sections of the plant came into operation in the middle of August and further units are now in operation. A second stage has been approved and will continue without interruption after the completion of the first stage.

W. R. Sykes Interlocking Signal Co.

A sharp increase in profit is shown for the year ended September 27 last. The trading profit, etc., is £44,737 compared with £25,080 for the previous year, while the net profit is £12,783 (*£8,308*).

Dividends Declared

Cables Investment Trust.—Interim of 3% (2%). The increase, however, does not indicate a larger total for the year.

S. Guiterman and Co.—Ordinary dividend 7½% (*same*). Consolidated net profit is £15,035 (*£23,968*) before taxation.

J. and E. Hall.—Final dividend 10% making a total of 12½% for the year (*both same*). Net profit is £57,462 (*£111,847*).

Lightfoot Refrigeration.—Interim of 3% (*same*).

Redfern's Rubber Works Ltd.—Final Ordinary dividend of 5%, making 10%, but the bonus is reduced by 2½% to 7½%, making a total of 17½% (*20%*) for the year.

Waygood-Otis.—With a final dividend of 25% the total for 1952 is again 55%. Profit for the year is £345,761 (*£266,225*) after providing for depreciation and directors' remuneration, and including investment income.

Commercial Information

CONTRACTS OPEN

HOME

Feb. 20.—Edinburgh. Electrical installation at Gorgie Slaughterhouses. City Architect, City Chambers.

Feb. 20.—Cleethorpes T.C. Installation of new fluorescent lighting and lighting effects system (including stage lighting) in Pier Pavilion. Details from Publicity Manager, "The Knoll," Knoll St. (See Feb. 5 issue.)

Feb. 20.—N. Ireland. Electrical work—extension, alteration and installation of new system—at Banbridge Hospital. T. T. Houston and Co., chart. architects. 26 College Gardens, Belfast.

Feb. 21.—Altrincham T.C. Electric lamps and concrete columns for street lighting required during year ending Mar. 31, 1954. Borough Surveyor, Town Hall.

Feb. 21.—Dungannon. Wiring and heating installations at Presbyterian church. Particulars from S. A. Sayers, Scotch Street.

Feb. 21.—Manchester. Installation of two electric passenger lifts at Openshaw College for Further Education. City Architect, Town Hall. Deposit £1 1s. (See Feb. 5 issue.)

Feb. 23.—Haslingden T.C. Supply and installation of 26 140-W sodium lights and concrete columns in Group A along Manchester Rd. Lighting Superintendent, Salem St.

Feb. 23.—Kincardine. Electrical work in extensions to Laurencekirk junior secondary school. County Architect, 34 Market St., Stonehaven.

Feb. 23.—N. Ireland. Electrical installation in 325 houses at Falls No. 3 for Housing Trust. Offices at 12 Hope St., Belfast. Deposit 10s.

Feb. 23.—Tynemouth. Electric lamps and cable, lamp columns and reflectors required during year ending Mar. 31, 1954. Borough Surveyor, D. M. O'Herlihy, 16 Northumberland Sq., North Shields.

Feb. 23.—West Riding. Conversion from gas to electrical installation at Selby county senior and J.M. school in Flaxley Rd., Selby. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £2 2s. (See Feb. 5 issue.)

Feb. 24.—Bedlington U.D.C. Housing materials required include electrical goods and cable requirements. Engineer and Surveyor, Council Offices, Front Street.

Feb. 25.—Bath. Electrical installation in 12 maisonnettes and flats on Wansdyke estate. City Planning Officer and Architect, 7 North Parade Buildings. Deposit £1 1s.

Feb. 25.—Maghera (Londonderry). Supply and installation of electrical heating units and lighting at Fair Hill primary school. Architect is R. T. McGuckin, 1 Garden St., Magherafelt.

Feb. 26.—Dewsbury T.C. Supply of various street lighting equipment, including lanterns, lamps, cables, brackets, control gear, columns. C. H. Midson, Street Lighting Engineer, 27 Battye Street. (See Jan. 22.)

Feb. 26.—Stockport T.C. Supply of lanterns, chokes and capacitors, synchronous time switches, electric lamps for street lighting. W. F. Gardner, Borough Surveyor, Town Hall.

Feb. 27.—Ballymoney. Electrical installation in extensions to Dalriada school. R. Robinson and Sons, Riada House, Ballymoney. Deposit £3 3s.

Feb. 27.—Basingstoke. Park Prewett Group Hospital Management Committee requires supply of electric lamps during six months beginning April 1. Group Secretary is F. Hales, Park Prewett Hospital, Basingstoke, Hants.

Feb. 27.—Wakefield. Erection of about 180 class A concrete columns and supply and installation of lanterns for street lighting. City Engineer, Town Hall. (See Feb. 12 issue.)

Feb. 28.—Chadderton U.D.C. Supply of electric lamps during the 12 months ending Mar. 31, 1954. Engineer and Surveyor, Town Hall.

Feb. 28.—Exeter. Supply of electric lamps to some 30 hospitals under Exeter and Mid-Devon, E. Devon and Exeter Special Hospital Management Committees, during year ending Mar. 31, 1954. Apply to Purchasing Office at Royal Devon and Exeter Hospital.

Feb. 28.—Irlam U.D.C. Supply of electric lamps required for year ending Mar. 31, 1954. Engineer and Surveyor, Council Offices.

Feb. 28.—Leeds. Supply of 50 side entry and one top entry totally enclosed 140 W sodium lanterns with control gear. Town Clerk, Civic Hall. (Advertised in this issue.)

Feb. 28.—Wexford. Supply and installation of electrically driven pumping plant and equipment for Edenvale pumping station. Consulting Engineers, Delap and Waller, 63 Lower Baggot St., Dublin. Deposit £5 5s.

Mar. 2.—Manchester. Rewiring and additions to electrical installation at Gt. Moreton Hall, Astbury. City Architect, Town Hall. Deposit £1 1s. (See Feb. 5 issue.)

Mar. 2.—N. Ireland. Electrical work in 70 flats, 9 shops and 2 offices at Sunnylands, Carrickfergus. N.I. Housing Trust, 12 Hope St., Belfast. Deposit 10s.

Mar. 3.—Gt. Yarmouth T.C. Supply of electric cables for one year from April 1. Borough Engineer, Town Hall. (Advertised in this issue.)

Mar. 4.—Manchester. Supply and erection of four centrifugal pumps with electric motors, automatic switch and control gear, etc., for Poundswick B Booster station. Secretary, Waterworks Offices. Town Hall. Deposit £1 1s.

Mar. 6.—Southport T.C. Floodlighting of jumping ring at Flower Show on Mar. 26, 27 and 28. Details from Secretary, Southport Flower Show, Victoria Buildings, Lord Street. (Advertised in this issue.)

Mar. 7.—Longbenton U.D.C. Installation of electricity in 20 houses at Forest Hall and 32 at Wideopen. A. S. Sweetman, surveyor, Council Offices, Forest Hall, Newcastle. Deposit £2 2s.

Mar. 7.—Llanelly. Installation of stage lighting equipment, emergency lighting, cables, switches, etc., at Pontyberen Memorial Hall and Institute.

Applications by March 7 to G. Bowen, Secretary of Institute, Llanelly.

Mar. 7.—Merthyr Tydfil T.C. Certain electrical goods required during year beginning April 1. Borough Engineer and Surveyor, Town Hall.

Mar. 7.—Wexford. Supply and erection of fully equipped electrically driven centrifugal pumping plant and water treatment plant at Taghmon. T. J. O'Connor, consulting engineer, Commercial Bldgs., Dame St., Dublin. Deposit £5 5s.

Mar. 9.—Eton R.D.C. Manufacture and installation of seven sets of electrically driven vertical unchokable sewage pumps with ancillary equipment, for three stations in Denham drainage scheme. Consulting Engineers, John Taylor and Sons, Artillery House, Artillery Row, Westminster. Deposit £5.

Mar. 10.—Thurles U.D.C. Supply and installation of duplicate electrically driven pumping plan at Lady's Well. Nicholas O'Dwyer, Consulting Engineer, 6 Burlington Rd., Dublin. Deposit £5 5s.

Mar. 14.—Frimley and Camberley U.D.C. Installation of electric light in 132 houses in district. Engineer and Surveyor, Municipal Buildings, Camberley. (See Feb. 12 issue.)

Mar. 18.—Galway. Electrical installation at fire station at Carryglass. J. C. Costello, consulting engineer, 21 Leeson Park, Dublin. Deposit £5 5s.

Mar. 24.—Ilford T.C. (*a*) supply of 158 140 W sodium lanterns, lamps, jackets and control gear, and (*b*) supply, erection, etc., of 158 concrete columns and installation of lanterns, etc. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s. for each contract. (See Feb. 12 issue.)

No date stated.—Barrhead T.C. Electrical work in erection of 20 houses in Auburn Drive and 8 in Bellfield Crescent. William Baillie and Son, architects, 4 West Regent St., Glasgow.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horse Guards Avenue, S.W.1, quoting reference.*

Mar. 3.—India. Supply of electric lamps of various types, viz., general service, train lighting, automobile, sodium and mercury, floodlighting, etc., during year ending June 30, 1954. Director General Supplies and Disposals, Shahjahan Rd., New Delhi.

Mar. 7.—Iraq. Electrical equipment, including a 220 V d.c. lighting set and switchboard, required for pumping machinery. Development Board of Iraq, Baghdad. B.o.T. (Ref. CRE 4361/53).*

Mar. 14.—Pakistan. Supply of two diesel oil engine driven portable d.c. generating sets, 30 kW, 240/250 V, 2 wire d.c. Director General, Supply and Development, Frere Rd., Karachi. B.o.T. (Ref: CRE 5275/53).*

Mar. 19.—Uruguay. State Railways Administration require supply of some 38,700 incandescent lamps between 25 W and 500 W, to operate on 230 V, 50 c/s a.c. supply. B.o.T. (Ref. CRE 4410/53).*

Mar. 23.—Portuguese E. Africa. Supply of one motor pumping set for supplying water to railway, for Porto Railways and Transports Administration, Lourenco Marques. B.o.T. (Ref: CRE 4651/53).*

Mar. 25.—New Zealand. Supply of 500 condensers, paper, tubular, miniature, metal cased, nom. cap. 0·1 mfd, 500 V, not greater than 2½ in. by ¾ in. Director General (Stores Div.), G.P.O., Wellington.

Mar. 25.—S. Rhodesia. Supply of 159 rural and distribution type transformers, up to and including 500 kVA, and spares. Electricity Supply Commission, P.O. Box 377, Salisbury. B.o.T. (Ref: CRE 4269/53).*

Mar. 25.—Uruguay. Supply of about 3,100 fluorescent lamps, between 15 W and 40 W, wanted by State Railways Administration to work on a.c. mains, 220 V, 50 c/s. B.o.T. (Ref. CRE 4453/53).*

CONTRACTS PLACED

Amblecote U.D.C. Lighting of county district roads and connecting to mains, Midland Electricity Board, £3,542.

Berwick T.C. Provision of lighting on Royal Tweed Bridge, General Electric Co. Ltd., £1,340.

Blyth T.C. Electrification of 867 council houses (Phase 1), Adamson and Co. (Tyne) Ltd., J. Watson Ltd., and Z Electric Lamps and Supplies Ltd.

Dagenham T.C. Supply and erection of 93 Group A street lighting units along four roads, Eastern Electricity Board £4,714.

Dundee. Electrical work at Duncan of Jordanstone College of Art, Lowdon Bros. and Co. Ltd., £4,531.

Swanage U.D.C. Installation of electricity in Bell St. scheme, G. W. Foster and Co., £1,571.

Your Queries Answered

"Sector" radiators, suppliers of? M.N.—Electrical Components Ltd., Components House, Ludgate Hill, Birmingham 3. (24966)

All rubber plugs, makers of? N.E.—Wm. Sanders & Co. (Wednesbury) Ltd., Riddings Lane, Wednesbury, Staffs. British Insulated Callender's Cables Ltd., Bical House, Bloomsbury St., W.C.1. W. W. Haffenden Ltd., Richborough Rubber Works, Sandwich, Kent. (25025)

"Pribro" fires, suppliers of? A.B.—Formerly Price Bros., Ltd., now Cambrian Appliances, Canal Road, Newtown, Montgomeryshire. (25031)

"Ligarex" tools, suppliers of? C.H.—Altendorf and Wright, 1 Havelock Road, Handsworth, Birmingham, but there is no trace of this concern at the present time. (25039)

"Suratel" suppressors, makers of? A.B.—Wolf Electric Tools, Ltd., Pioneer Works, Hanger Lane, Ealing, W.5. (25047)

"Thermoheat" blankets, makers of? S.W.—These were supplied by Sound, 483 Barlow Moor Road, Manchester 21, but we have been unable to trace this concern since 1951. (25058)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE NOTES

Beama Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at February 14, 1953, shall be deemed to be 141s. 6d. (*b*) "Cost of Material"—the index figure for Materials used in the Electrical Machinery Industry, published in the Board of Trade Journal on February 14, 1953, is 162·2.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at February 14, 1953, shall be deemed to be 141s. 6d. (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on February 14, 1953, are: Materials used in Mechanical Engineering Industries—148·6. "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—142·3. The price of brass condenser tubes ¾ in. o/d. 18 SWG published in The Metal Bulletin on February 13, 1953, is 3s. 10¼d. per lb.

For Outstanding Contracts covered by the B.o.T. Intermediate Products Index. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at February 14, 1953, shall be deemed to be 141s. 6d. (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on February 14 1953, is 359·7.

E.L.F.A. The Franco-British Electrical Co. Ltd. has become a member of the decorative, commercial and industrial sections of the Electric Light Fittings Association.

Phone Nos. Enfield Cables' branch at 5 Queens Road, Quadrant, Brighton 1. (Telephone: Brighton 26429) have now had further telephone lines installed. The additional telephone number is Brighton 25828 (two lines).

Agency. Truvox Ltd. announce that their agent for South Wales, Mr. R. H. Hughes, has relinquished his agency because of ill health. The agency has now been accepted by Southern Electrical Agencies, of 16 Victoria Road, Penarth, Glam (phone Penarth 372) who will handle Truvox appliances and Rola and Celestion loudspeakers.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	93-93¼	108 0 0
,, ,, "English" quality	94½-94¾	
Tin (99·99·75%) ...(Cash)	955-957	—
,, (3 months)	939-940	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	80¼-80½	92 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	51 10 0	—
Mild Steel Tape (0·04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Cadet Industries Ltd., Farnham, Surrey. First and final dividends of 5d. in £ payable tomorrow (Friday) at 25 Bedford Row, London W.C.1.

J. W. Collins and Sons Ltd. Meetings of creditors and contributories will take place at Inveresk House, Strand, London, W.C.2. on Feb. 24 at 2.30 p.m. and 3 p.m. respectively.

Madeira Electric Lighting Co. (1909) Ltd. Resolution for voluntary winding-up passed at meeting on Feb. 4, when James Laughland, Barton, Mayhew and Co., Alderman's House, Bishopsgate, London E.C.2 was appointed liquidator.

Pilmore-Bedford Refrigerator and Engineering Co. Ltd. Meeting of creditors will be held at A.C. Palmer and Co., 21 Knightsbridge, S.W.1, on Feb. 26 at 2.30 p.m.

Partnerships Dissolved

Acorn Electrical and Engineering Co. Partnership between George W. Bennett and Kenneth Knapton, trading as electrical and mechanical engineers at 409a Leeds and Bradford Rd., Leeds, dissolved as from Dec. 31. Debts received and paid by K. Knapton, who will continue business.

Partnership between Herbert Thomas and Thomas J. Corfield trading as **Walsall Accumulator Co.,** at 20 and 21Lr. Hall Lane, Walsall, dissolved as from Jan 31. Debts received and paid by T. J. Corfield who will continue business.

BANKRUPTCY ACTS

Receiving Orders

Birmingham. Wilfred J. Layton, electrical engineer trading at 102 Evesham St., Redditch. Date of receiving order, Feb. 6.

Birmingham. Henry Tansey trading as electrical contractor at 53 Hollydale Rd., Erdington. Receiving order dated Feb. 9.

Appointment of Trustee

Manchester. Frank L. Napier, electrical contractor, trading at 5 School Rd., Sale. Trustee is G. H. Eaves, C.A., 47 Mosley St., Manchester.

Release of Trustee

Blackpool. Sydney H. Lukey, electrical engineer trading at Roseway Works, 640 Lytham Rd., Blackpool. Trustee was F. C. Ormrod, Official Receiver, 20 Byrom St., Manchester.

Intended Dividends

Aylesbury. Leonard G. Sharp, electrician trading at 4 Summerley's Rd., Princes Risborough. Last day for receiving proofs, Mar. 2. Trustee is J. H. Marshall, Grenville House, High St., Princes Risborough.

Leominster. Claude D. Weatherhead, trading as electrical engineer "Mortimer and Weatherhead," at Burway Bridge Garage Ludlow. Last day for receiving proofs, Mar. 10. Trustee is R. F. Bendall, 126 Colmore Row, Birmingham.

London. Charles F. Adams and Frank Harris, trading as Swift Bros., electrical engineers, at 351 Forest Rd., Walthamstow. Last day for receiving proofs, Feb. 28. Trustee is W. F. Cresswell, Official Receiver, Bankruptcy Buildings, Carey St., W.C.2.

Order Rescinded

Birkenhead. Gordon Towell, electrician trading as Stafford Radio at 183a Grange Rd., Birkenhead. Receiving order rescinded as from Jan. 26. Petition withdrawn. Grounds ot rescision: less than £50 owing at date of issue of petition.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Dialam. 712,731. Class 9. Electrical apparatus. Permali, Ltd., 125, Bristol Rd., Gloucester.

Nautilus. 712,410. Class 7. Electric motors. Yeovil Sheet Metal Co. Ltd., Nautilus Works, Yeovil.

BUSINESS PROSPECTS

HOME

Ashington U.D.C. Land being acquired for erection of 800 houses.

Aylesbury R.D.C. Tenders to be invited between now and September for erection of a total of 136 houses on six sites.

Barnstaple T.C. Tenders to be invited for rewiring Pannier Market.

Barrow T.C. Erection of 119 houses on Tummerhill estate. J. N. Flitcroft, Borough Engineer and Surveyor, Town Hall.

Belfast. Layout plans approved for 300 houses on New Barnsley estate.

Boreham Wood. Herts C.C. inviting tenders for erection of infants' school and Part 3 health clinic at Saffron Green.

Camberwell B.C. Erection of 234 flats on Denmark Hill estate. Director of Housing, Town Hall, Peckham Rd., S.E.5.

Chatham T.C. Eight shops to be built on Weeds Wood estate.

Chelsea. Tenders shortly to be invited for erection of 32 dwellings in Limerton Street.

Clayton-le-Moors U.D.C. Total of 50 dwellings to be built on the Field Bottoms estate.

Cleckheaton. It is proposed to renew electrical installation at Whitcliffe Mount Grammar School at cost of £2,545.

Cupar. T.C. approved conversion from gas to electricity in 175 houses. Estimated cost, £5,000.

Doncaster T.C. Smiths (Mineral Waters) Ltd., are to build new factory at Long Sandall.

Dudley T.C. Tenders will shortly be invited for erection of 200 houses on Tansley Hill estate.

Dumbarton. Dean of Guild Court has approved £13,500 extension to machine shop of Dewrance Engineering Works in Glasgow Rd.

Felling U.D.C. Loan sanction for £108,425 sought for erection of 76 houses in Fisherwell Rd., Pelaw.

Grimsby R.D.C. Erection of 100 houses at Immingham to start in spring.

Halesowen T.C. Construction of 30 houses on Howley Grange estate. J. C. T. Cole, architect, Central Buildings, Long Lane, Blackheath, Birmingham.

Hampstead. Scheme in hand for erection of 79 flats, 250 maisonettes, and 12 houses on Finchley Rd. No. 1 (West) site.

Hornchurch U.D.C. Erection of 78 flats in Front Lane, Cranham. Surveyor, Council offices.

Hull. Construction of Longhill primary school. City Architect's Dept., Guildhall.

Islington. Scheme in hand for first stage of Highbury Quadrant primary school. Estimated cost, £102,533. Architect is J. Howe, 12 Spring St., London W.2.

Jarrow T.C. Construction of 41 houses in Ormonde St. being considered.

Kesteven. It is proposed to extend Grantham Technical College at cost of £93,116.

Kilkenny. Approval given to £15,350 improvements at St. Colomba's Hospital, Thomastown.

Kingston-on-Thames T.C. Tenders may be invited soon for erection of 105 flats on Chessington Hall estate.

Lancashire. County branch of N.F.U. proposes to build a bacon factory at cost of about £200,000.

Larchgrove. Scottish Home Dept. has approved final plans for erection of £75,000 remand home.

Leatherhead. Plans in hand for erection of eight shops and five flats on Bookham Grove estate.

London. Installation of electricity proposed in following primary schools: Ballamore, Lamorbey, Lamorbey Park, Lamorbey Park Annexe, Lamorbey Park Senior, Lamorbey Park Senior Annexe, Lamorbey Park Senior Girls', Lamorbey Park Senior Girls' Annexe, Lamorbey Park Senior Mixed, Lamorbey Park Senior Mixed Annexe, Lamorbey Park Senior Mixed Annexe, Lamorbey Park Senior Mixed Annexe

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 113 Chancery Lane, London W.C.2.

Bowley Electrical Machinery Co. Ltd., 5a Palmerston Rd., Harrow, Middlesex. Electrical engineering contractors, etc. Cap.: £2,500. Dirs.: G. M. Bowley and G. J. Leavett.

Burns Heating Co. Ltd., Glebe Buildings, Glebe St., Stoke-on-Trent. Heating and ventilating engineers and fire protection experts and advisers, etc. Cap.: £5,000. Dirs.: J. S. A. Burns and J. C. Clay.

Fringevision Ltd., Angel Yard, Marlborough, Wilts. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, etc. Cap.: £1,000. Dirs.: G. T. Francis and Margaret M. Francis.

Gibson, Wright and Co. Ltd., 85 Bridge St., Bradford. Manufacturers of and dealers in batteries, dynamos, accumulators, motors, etc. Cap.: £1,000. Dirs.: W. Gibson and A. B. Wright.

Arthur Millman (Electrical) Ltd., Wheatcroft, Purlwell Lane, Batley. Electrical, radio, television and mechanical engineers, etc. Cap.: £2,000. Dirs.: A. Millman and J. R. Gibson.

Thistlethwaite and Edgar, Ltd., Back St. Annes Rd. West, Lytham St. Annes. To take over business of electrical and radio engineers carried on as "Thistlethwaite and Edgar," at Lytham St. Annes. Cap.: £2,500. Dirs.: Nellie Thistlethwaite and J. Thistlethwaite.

Visionaire Ltd., 1 Rumford St., Liverpool, 2. Television and radio engineers, electricians, electrical engineers, etc. Cap.: £1,000. Dirs.: not named. Subs.: H. Gerrard and J. H. Hilton.

S. and R. Wholesale (Bradford) Ltd. Wholesale suppliers and distributors of and dealers in electric motors and motor control gear, switch gear, armatures, etc. Cap.: £100. Dirs.: A. Southern, High Gables, The Sycamores, Bramhope, Yorks; F. N. Wardman, 8 Sedbergh Park, Ilkley; W. Womersley and K. A. Wood.

Yudo (Anglo-Indonesian) Ltd. General and aeronautical engineering consultants and dealers in and manufacturers of electrical and aeronautical equipment and plant, etc. Cap.: £500. Dirs. to be appointed by subs. Subs.: J. Cooper and J. Roberts, 89 Kingsway, W.C.2.

MEETINGS TO NOTE

THURSDAY, FEB. 19

A.S.E.E. (Kent Branch).—"Ball and Roller Bearings." T. S. Nisbett. Royal Star Hotel, Maidstone, 8 p.m.

I.E.S. (Glos. and Cheltenham Centre).—"Lighting of Architecture." G. Grenfell Baines. Cadena Café, High St., Cheltenham, 6.15 p.m.

I.E.E. (London Utilisation Section). — "Fluorescent Discharge-Tube Circuit and Operating Problems." J. Cates. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Domestic Electrical Installations: Some Safety Aspects." H. W. Swann. George Hotel, Kettering, 7 p.m.

I.E.E. (Irish Branch).—"Electricity Supply Board's Load Despatch Equipment." P. J. Campbell and G. S. Stritch. Trinity College, Dublin, 6 p.m.

FRIDAY, FEB. 20

Instn. of Works Managers (Notts and Derby Branch).—"Fuel Economy." L. G. Northcroft. Midland Hotel, Derby, 8 p.m.

Instn. of Heating and Ventilating Engrs. (Manchester).—"Corrosion in Boilers." J. C. Staintor, Engrs. Club, Albert Sq., 6.30 p.m.

I.E.E. (Western Centre).—Annual dinner and dance at Grand Spa Hotel, Bristol, 6.45 p.m.

I.E.E. (London Educ. Circle).—Discussion on "Circuit Conventions —a.c. Circuit Vector Diagrams." J. G. Fleming, Savoy Place, W.C.2, 6 p.m.

I.E.E. (S. Midland Centre).—Discussion on "Co-ordination of Technical and Practical Training." College of Technology, Broad St., Birmingham, 6.30 p.m.

MONDAY, FEB. 23

A.S.E.E. (Bournemouth Branch). —"Electrical Progress and Developments." E. H. Turle. Grand Hotel, Firvale Rd., 8.15 p.m.

I.E.S. (Leeds Centre).—"Lighting in Mines." W. L. J. Potts. 24 Aire St., 6.15 p.m.

I.E.S. (Leicester Centre).—"Lighting for Display." T. S. Jones. Elect. Showroom, Charles St., 6.30 p.m.

I.E.E. (London Radio Section).—"Radio Aids for Airport Control." G. W. Stallibrass. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.E. Centre).—"Logical Approach to Problems of Space-warming." D. H. Parry. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (S. Midland Group).—"High-Gain d.c. Amplifiers." K. Kandiah and D. E. Brown. James Watt Inst., Great Charles St., Birmingham, 6 p.m.

I.E.E. (Western Utilisation Group). —"Electrical Installation in Nylon Yarn Factory." B. C. Robinson. S. Wales Inst. of Engrs., Park Place, Cardiff, 6 p.m.

TUESDAY, FEB. 24

A.S.E.E. (York Branch).—"Rupturing Capacity of Switchgear." J. Sykes. Creamery Restaurant, Pavement, 7.30 p.m.

British Instn. of Radio Engrs. (W. Midland).—"Development of Radio and Electronics Industry in India." G. D. Clifford. Tech. College, Wulfruna St., Wolverhampton, 7.15 p.m.

Instn. of Heating and Ventilating Engrs. (Scottish).—"Electrical Equipment for Heating and Ventilating Engineers." J. M. Hulley. 351 Sauchiehall St., Glasgow, 6.30 p.m.

I.E.S. (Cardiff Centre).—"Modern Airport Lighting." J. W. Morse. Elect. Board Offices, 5.45 p.m.

I.E.S. (Liverpool Centre).—"Development of Tungsten Lamp." B. P. Dudding. Elect. Showroom, Whitechapel, 6 p.m.

I.E.E. (N. Midland Centre).—"Electrical Equipment of Battery Road Vehicles." W. D. Sheers. Y.E.B., Ferensway, Hull, 7.15 p.m.

WEDNESDAY, FEB. 25

I.E.S. (London).—Discussion on "Lighting of Pedestrian Crossings." 2 Savoy Hill, W.C.2, 6 p.m. Entries in Dow Prize Competition to be displayed and prizes presented.

I.E.S. (Swansea Group). "Modern Airport Lighting." J. W. Morse. Minor Hall, Y.M.C.A., 6 p.m.

I.E.E. (London Supply Group).—"Bushings in Relation to Service Conditions." H. Barker and H. Davies. Savoy Place, 5.30 p.m.

I.E.E. (Southern Centre).—"Technique of Manufacture of Reliable Valves." E. A. Roberts. S. Dorset Tech. College, Weymouth, 6.30 p.m.

THURSDAY, FEB. 26

A.S.E.E. (Luton Branch). "Some Applications of Heat Exchange." H. E. Holt. George Hotel, 8 p.m.

E.P.E.A. (S. Western Tech. Group).—"Operation of British Grid System." L. B. Law. Elect. House, Colston Ave., Bristol, 7.15 p.m.

I.E.S. (Bradford Group).—"Interior Decoration and its Influence on Lighting." Y.E.B., 45-53 Sunbridge Rd., 7.30 p.m.

I.E.E. (London).—Annual dinner at Grosvenor House, Park Lane, 7 p.m.

FRIDAY, FEB. 27

E.P.E.A. (Southern Tech. Group). —"Behaviour and Failure of Metals under Service Conditions in Supply Industry." H. E. Davies. B.E.A. Offices, Portsmouth, 7 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Domestic Electrical Installations: Some Safety Aspects." H. W. Swann. Elect. House, Llandudno Junction, 6.30 p.m.

EXHIBITION DIARY

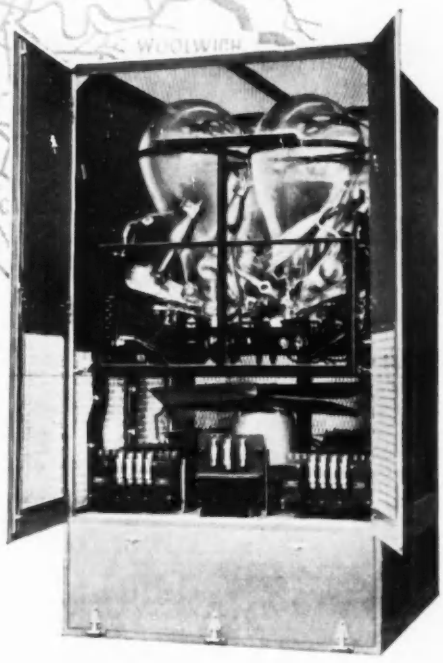
Inventions and New Ideas. Opened yesterday at Central Hall, Westminster. Closes on Feb. 28.

Daily Mail Ideal Home. Opens on Mar. 3 at Olympia, London, and continues until Mar. 28.

Factory Equipment. Opens on Mar. 23 at Royal Horticultural Society's New Hall, Westminster. Closes on Mar. 27.

Electrical Engineers' Second National Exhibition will open at Earls Court on Mar. 25, continuing until Mar. 28.

200,000 kW. in service
140,000 kW. on order
for the Greater London Area alone.



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ELECTROLYTIC PLANT

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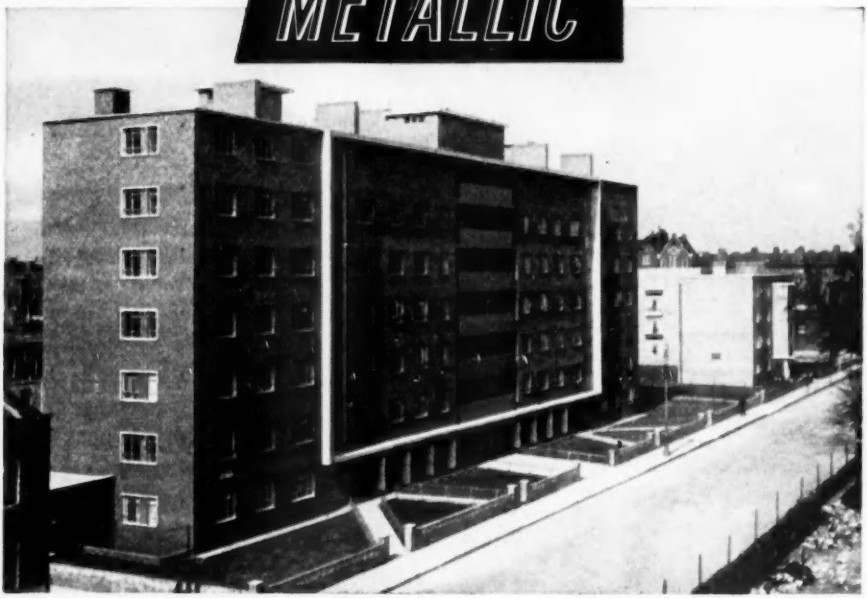


Godwin House, St. Marys Estate, Shoreditch.

(With acknowledgement to Shoreditch Borough Council and Iverson Electrical, Ltd.)

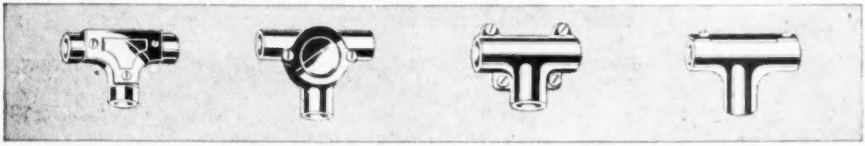
A TI COMPANY

It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This new block of flats is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

THE METALLIC SEAMLESS TUBE CO. LTD.

LUDGATE HILL • BIRMINGHAM • 3



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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

COUNTY BOROUGH OF GREAT YARMOUTH

CONTRACT FOR ELECTRIC CABLES

THE COUNCIL are prepared to receive tenders for the supply of electric cables for a period of one year from April 1, 1953.

Specification, form of tender and conditions of contract may be obtained from the Borough Engineer, Town Hall, Great Yarmouth.

Tenders, upon the form supplied, in plain, sealed envelopes endorsed "Tender for Cables," must reach me not later than Tuesday, March 3, 1953.

The Council do not bind themselves to accept the lowest or any tender.

FARRA CONWAY,
Town Clerk.

Town Hall,
Great Yarmouth.
February 10, 1953. (C 655)

LEEDS CORPORATION

TENDERS are invited for the supply of 50 side entry and one top entry (1 in. B.S.P.) totally enclosed 140 W SODIUM LANTERNS complete with the necessary control gear, to be housed in the canopy.

Sealed tenders, in plain envelope and endorsed "Tender Sodium Lanterns" to be forwarded to the Town Clerk, Room 57, Civic Hall, Leeds 1, not later than Saturday, February 28, 1953.

L. A. DOXEY,
Engineer.

Street Lighting Department,
Leeds 12. (C 675)

COUNTY BOROUGH OF SOUTHPORT

SOUTHPORT FLOWER SHOW

TENDERS are invited for the FLOODLIGHTING of the JUMPING RING on August 26, 27 and 28, 1953. Further details may be obtained from the Secretary, Southport Flower Show, Victoria Buildings, Lord Street, Southport.

Tenders, etc., in plain sealed envelopes, bearing no name or mark by which the sender can be identified, must be delivered to me not later than 10 a.m. on Friday, March 6 next.

R. EDGAR PERRINS,
Town Clerk.

Town Hall, Southport.
February 5, 1953. (C 637)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICAL POWER ENGINEERS' ASSOCIATION

NOTES TO MEMBERS

AS A RESULT of negotiations between the South Eastern Division of the British Electricity Authority and the Electrical Power Engineers' Association, the difference over the issue of advertisements for vacancies has now been resolved and the position of existing members at Littlebrook Power Station fully safeguarded. The Association now withdraw their request to members not to apply for the positions advertised last week. (C 574)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 5 (Wakefield) Sub-Area

Barnsley District

CONSUMERS' ENGINEER

Applicants, who must have had a sound practical training and considerable experience in the work of a consumers' engineer, will be required to give advice to all classes of consumer concerning the utilisation of electricity.

Experience is required in negotiations for supply; the interpretation and application of the I.E.E. Wiring Regulations and other regulations concerned with the testing and inspection of consumers' installations; tariffs; sales development; the control of staff and manual workers.

Salary: N.J.B. Class "F", Grade 8, £635 to £664 p.a.

Standard application forms may be obtained from the Manager No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1A Denby Dale Road, Wakefield, and should be returned not later than March 5, 1953.

No. 1 (Bradford) Sub-Area

Skipton District

SECOND ASSISTANT DISTRICT ENGINEER

Applicants should have passed the Graduateship Examination of the Institution of Electrical Engineers, or hold recognised equivalent technical qualifications, have substantial experience in construction, operation and maintenance of high voltage systems, underground cables and overhead lines and substations, and medium and low voltage networks.

Candidates should be prepared to reside within the district and undertake standby duties if required.

Salary: N. J. B. Class "D", Grade 7, £633 to £643 p.a.

Applications, giving full details of age, qualifications and experience should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than March 5, 1953.

No. 7 (Grimsby) Sub-Area

Grimsby District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants preferably should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and should have experience in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution networks, substation plant and ancillary equipment.

Salary: N.J.B. Class "F", Grade 9, £607 to £629 p.a.

Applications, giving full details of age, qualifications and experience should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than March 5, 1953. (C 662)

SOUTH EASTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER

Croydon District

SALARY £548-£565 p.a., plus London Weighting under N.J.B. "F." 11. Superannuable. Applicants should be suitably qualified and have practical experience in e.h.v. and l.v. three- and single-phase distribution.

Applications, giving two referees, on forms obtainable from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Road, Croydon, to be returned to him by February 28, 1953.

A. L. BURNELL,
Secretary.

February, 1953. (C 683)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF THIRD ASSISTANT ENGINEER
Planning and Development Section, Chief Engineer's Dept., Area Board Headquarters

APPLICANTS should have had a sound fundamental training in electrical engineering and general experience in electricity distribution. Preference given to applicants possessing a university degree or H.N.C. in electrical engineering.

Duties will include the calculation of system fault levels and load flows on complicated networks, and a good knowledge of mathematics is essential.

Salary range: £649 to £883 p.a., Grade "AX.EX" 5. N.J.B. conditions. Commencing salary within range £649 to £790 p.a., according to qualifications and experience.

Applications to Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, by February 28, 1953.

APPOINTMENT OF GENERAL ASSISTANT ENGINEERS
(Installation Contracts), Sub-Area Commercial Department, Bolton

Applicants should have experience in the preparation of schemes and estimates and the supervision of all types of installation work in industrial and commercial premises and public buildings.

Salary scale: £661 to £681 p.a. Grade "M" 13, N.J.B. conditions.

APPOINTMENT OF DEMONSTRATOR
Chorley District

Applicants should be qualified to lecture and advise on the utilisation of electric cookers, washing machines, refrigerators, and other domestic appliances, and to give public demonstrations in service centres and at exhibitions. Preference given to applicants who hold the E.A.W. Diploma. If not already held, the successful applicant will be required to obtain such diploma.

Salary scale: £380 to £470 p.a. Grade 1, N.J.C. conditions. Progress beyond £420 p.a. will be subject to a certificate that the person appointed is capable of undertaking all the duties of the grade.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by February 28, 1953.

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
Oldham District

Applicants should have had a good general and technical education and be competent to control staff. Practical experience in electrical engineering, workshop practice, the operation of consumers' repair and maintenance service, and knowledge of the development and utilisation of electricity to light industrial, commercial and domestic users, is essential.

Salary scale: £729 to £758 p.a. Grade "G" 7, N.J.B. conditions.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN (BUILDING)
Sub-Area Headquarters, Oldham

Applicants should have a sound knowledge of building construction, be able to prepare detailed drawings and should also have had a suitable technical education with a good drawing office training.

Salary scale: £433 to £567 p.a. Schedule "D", Grade 6, N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union Street, Oldham, by February 28, 1953.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN (BUILDING)
Sub-Area Headquarters, Blackburn

Applicants should have had a good general and technical education to at least O.N.C. standard in building and civil engineering, and have had experience in general building construction, design and layout of industrial type buildings including site works and services.

Salary scale: £433 to £567 p.a. Schedule "D", Grade 6, N.J.B. conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee Street, Blackburn, by February 28, 1953. (C 664)

NORTH EASTERN ELECTRICITY BOARD

York Sub-Area

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER at Sub-Area Headquarters, York.

Applicants should have considerable experience of the construction, maintenance and operation of public lighting schemes.

Salary (Schedule "A," Class "G," Grade 10, £608 £630) and conditions of service in accordance with N.J.B. Agreement.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne 1, within 10 days of the appearance of this advertisement. (C 682)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement, Schedule "A."

TURBINE HOUSE SUPERINTENDENT
Bow Generating Station

Qualifications: Higher National Certificate (Electrical) with preferably membership of a recognised institute. Duties include responsibility for station operation and the electrical maintenance department. Wide experience necessary in maintenance of alternators, transformers, E.H.T. and L.T. switchgear and auxiliary plant. Salary, Class "F," Grade 6—£774 18s. p.a.

STATION SHIFT CONTROL ENGINEER
Grove Road Generating Station

Qualifications: up to Higher National Certificate standard or equivalent with sound engineering training. Some experience in control and operation of steam generating plant and main switchgear in modern power station. Salary, Class "F," Grade 10—£605 17s. p.a.

ASSISTANT ENGINEER (INSTRUMENTS)
Blackwall Point Generating Station

Qualifications: at least to Ordinary National Certificate standard. Experience in the care, repair and maintenance of all types of boiler house and turbine house instruments essential. Knowledge of automatic boiler control equipment preferable, with knowledge of combustion also advantage. Salary, Class "F," Grade 12—£532 7s. p.a.

Applications will only be considered on form obtainable from Divisional Secretary, B.E.A. London Division, Generation House, Great Portland Street, W.1, and returned within 14 days of this advertisement. (C 678)

CROWN AGENTS FOR THE COLONIES

SENIOR GENERAL ELECTRICAL ENGINEERING INSTRUCTOR required by the Mombasa Institute of Muslim Education, Kenya, for one tour of three years in the first instance with prospect of re-engagement. Salary according to qualifications and experience in scale £715, rising to £1,025 a year. Cost of living allowance £90-£100 payable in addition. Free furnished quarters or allowance in lieu. Outfit allowance £30. Free passages. Superannuation scheme. Candidates must have served an apprenticeship or pupilage to electrical engineering, and have had considerable practical experience. They should be A.M.I.E.E. or G.I.E.E. or possess degree exempting from G.I.E.E. examination.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.29814.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (C 621)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 19/53. FIRST or SECOND ASSISTANT STATION CHEMIST at Westwood Generating Station, Wigan. Salary £641 £667 (N.J.B. G.9) or £573 £596 (N.J.B. G.11) respectively. Candidates should preferably hold a degree of a British university or associateship of the Royal Institute of Chemistry, but consideration will be given to those with Higher National Certificate or studying for A.R.I.C. or equivalent examinations. Experience in chemical testing of coal, water and oil in connection with power plant is desirable but not essential, providing the applicant has had good experience in chemical analysis.

Vacancy No. 20/53. SECOND ASSISTANT CONTROL ENGINEER, System Operation Department, British Electricity House. Salary £530 £748 (N.J.B. AX.EX.7). Duties will be shift duties in the grid control room. Preference will be given to candidates who are graduates of the I.E.E. or who hold equivalent qualifications, and experience in a steam power station would be an advantage.

Vacancy No. 21/53. GENERAL ASSISTANT ENGINEER, System Operation Department, British Electricity House. Salary £501 £714 (N.J.B. AX.EX.8). Duties will be of a general technical and statistical nature in connection with power station operation. Applicants should have a good general education and technical qualifications up to Higher National Certificate standard are desirable.

Vacancy No. 23/53. DEPUTY POWER STATION SUPERINTENDENT, Wigan Generating Station. Salary £813 £843 (N.J.B. D.3). Engineering qualifications and experience in administration, operation and maintenance of a steam generating station is essential.

Apply, quoting vacancy number, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before February 28. (C 638)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

APPLICATIONS are invited for the undernoted engineering appointments at Sub-Area Headquarters, Kilmarnock, both of which are superannuable.

Meters, Testing, Protection and Communications
SENIOR ASSISTANT ENGINEER

Applications are invited from qualified engineers for the position of Senior Assistant Engineer at Sub-area Headquarters, Kilmarnock.

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and should have wide knowledge and experience of:

1. Metering practice, testing and repairs.
2. Testing of distribution equipment and fault location.
3. Modern protective systems.
4. Communications, supervisory and remote control systems.

Salary in accordance with N.J.B. Agreement, Schedule "A," Class "G," Grade 4—£905 to £944 per annum.

A house can be made available to the successful candidate if married.

Construction
THIRD ASSISTANT ENGINEER

Applications are invited for the position of Third Assistant Engineer (Construction) at Sub-Area Headquarters, Kilmarnock.

Applicants should be experienced in the construction of sub-stations, h.v. and l.v. overhead and underground mains and be graduates of the I.E.E. or possess equivalent qualifications.

Salary in accordance with N.J.B. Agreement, Schedule "A," Class "G," Grade 10—£808 to £830 per annum.

Forms of application may be obtained from the undersigned or any other sub-area manager and should be returned to me duly completed with any additional information not later than March 12, 1953.

A. E. ROOTS,
Manager.

Greenholm Street,
Kilmarnock.
February 13, 1953. (C 679)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following vacancies:—

STATION CHEMIST
Swindon (S 13/383)

Applicants should preferably be qualified industrial chemists with experience of fuel, oil and water testing. The position offers scope to a young man with generating station laboratory training wishing to enlarge his experience.

Salary, N.J.B., "E," 7, £649-£681.

JUNIOR ENGINEERS
S 13/384

Applicants should have had a sound general education and an apprenticeship or practical training suitable to the industry. Preference will be given to graduate members of a recognised professional institution or those possessing a University degree or Higher National Certificate. The duties of those appointed will vary, but will include, as a general rule, the operation and control, under supervision, of generating plant. Vacancies also exist for those who wish to specialise in the maintenance of instruments and other electrical and mechanical generating plant.

Salary, N.J.B., £390-£556, depending on qualifications, experience and the position to which appointed.

Application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High Street, Portsmouth, must be returned by March 4, 1953. (C 677)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 14/53

APPLICATIONS invited for following superannuable N.J.B. appointments:—

1. ASSISTANT MAINTENANCE ENGINEER (ELECT.), Newport Power Station F.8 (£635-£664 p.a.).
2. ASSISTANT MAINTENANCE ENGINEER (MECH.), Newport Power Station F.8 (£635-£664 p.a.).
3. FIRST ASSISTANT STATION CHEMIST, Uskmouth Generating Station, nr. Newport K.9 (£766-£796 p.a.).

Applicants for (1) and (2) should have obtained appropriate H.N.C. and had previous maintenance experience; for (3) should hold chemical qualification and had experience in water treatment, coal and oil testing, and corrosion problems.

Application forms obtainable from Div. Secretary, British Electricity Authority, South Wales Division, Twyn-y-Fedwen Road, Gabalfa, Cardiff, should be returned by March 5, 1953.

February 12, 1953. (C 676)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions in the Division.

SHIFT CHARGE ENGINEER
North Wilford. Vacancy No. 17/53

Applicants should have had sound technical training and practical experience in operation and control of a modern power station, including pulverised fuel plant.

Candidates should preferably have the Higher National Certificate in Electrical and Mechanical Engineering, and a Corporate Membership of the Institution of Electrical and or Mechanical Engineers will be an advantage.

The salary for this appointment will be in accordance with Class "K," Grade 7 (£869 to £907 per annum) of the N.J.B. Agreement.

SHIFT CONTROL ENGINEER
Staythorpe. Vacancy No. 18/53

Applicants should have had a sound training and practical experience in a modern generating station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be an advantage.

The salary for this appointment will be in accordance with Class "J," Grade 10 (£680 to £706 per annum) of the National Joint Board Agreement.

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department, North Wilford
Vacancy No. 22/53

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., or general building construction, drainage and sanitation schemes, associated with offices and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

The above positions will be pensionable under the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on Form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham and returned to the undersigned to reach him by February 27, 1953. Please quote Vacancy number.

JUNIOR ENGINEERS (4)
Shift Control Duties, Northampton Power Station
Vacancy No. 23/53

Candidates should have a sound engineering training with subsequent experience in a modern generating station and preferably have gained an Ordinary or Higher National Certificate in Electrical Engineering.

The salary will be in accordance with Schedule "A," Class "G," Grade 15 (£407 to £423 per annum).

This position will be pensionable under the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on Form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham and returned to the undersigned to reach him by March 6, 1953. Please quote Vacancy number.

L. F. JEFFREY,
Divisional Controller.
(C 680)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following superannuable appointment. Salary and conditions of service will be in accordance with the National Joint Board Agreement.

JUNIOR ENGINEER
Rye House Generating Station

Salary N.J.B., Class "G," Grade 16, £390; Grade 14, £473 p.a. according to qualifications and experience, rising to a maximum of £491 p.a.

Duties include assisting in the electrical control room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Previous experience in a generating station and or technical training to the standard of the Ordinary National Certificate or its equivalent will be of advantage.

Applications, stating age, details of qualifications and experience, should be addressed to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than February 28, 1953.

W. N. C. CLINCH,
Controller.
(C 661)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

ASSISTANT SHIFT CHARGE ENGINEER
Poole Generating Station

Applicants should have had previous experience in a large modern generating station and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage. Salary N.J.B. Class "H" Grade 9 (£690 to £706).

ASSISTANT SHIFT CHARGE ENGINEER
Swindon Generating Station

Applicants should have had previous experience in a modern generating station. Manufacturing works experience will be an advantage.
Salary N.J.B. Class "E" Grade 9 (£587 to £600).

For both posts, preference will be given to those who possess either qualifications and experience admitting to Corporate membership of a recognised professional Institution, or who are studying for the examinations of an Institution.

Application forms are obtainable from P. D. A. Oliver, Divisional Secretary, 111 High Street, Portsmouth, and should be returned not later than February 25, 1953. (C 660)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, COMMERCIAL ASSISTANT in District 226 (Llanelly) in the West Central Sub-Area.

Successful applicant will be required to assist in d.c. a.c. changeover and generally in all commercial duties in the district.

Salary in accordance with Class "E", Grade 7 (£649 £665 £681) of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by February 28, 1953.

Previous applicants need not re-apply.

D. G. DODDS,
Secretary.
St. Mellons, Cardiff. (C 681)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

MAINTENANCE ENGINEER (MECHANICAL) required at Sculcoates Power Station, Hull.

Salary £787 to £818 per annum, N.J.B. Agreement, Class "G," Grade 6.

Applicants must have had a sound technical training and experience in the operation of a modern power station, and preference will be given to candidates who are Corporate or Graduate Members of the Institution of Mechanical Engineers, or who hold equivalent qualifications.

Applications, on Form AE6, obtainable from Divisional Secretary (Establishments), British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(C 674)

SOUTH WESTERN ELECTRICITY BOARD

Taunton Sub-Area

FITTER (ELECTRICAL) required in the Sub-Area Maintenance Department. Wages and conditions of service in accordance with the N.J.I.C. Agreement.

Preference will be given to applicants with experience in the erection and maintenance of switchgear and transformers at voltages up to 33 kV.

Applications in writing to Sub-Area Manager, South Western Electricity Board, The Parade, Taunton, within 10 days of the appearance of this notice. (C 663)

A SALES MANAGER age 35-45 is required by a medium-sized company manufacturing well-known electrical accessories. Applications are invited from men with experience of the trade and ability to foster sound sales promotion schemes. Pension scheme in operation.—Write fully, giving age, previous position and salary expected, to Box No. 2427, Electrical Times. (C 696)

A SALES REPRESENTATIVE required by widely known cable and electrical accessory manufacturers, for south and south-eastern areas of England. Existing connection among B.E.A. and wholesalers an advantage. Good salary, expenses and car allowance.—Write fully to Box No. 2413, Electrical Times. (C 685)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

INSTRUMENT ENGINEER

required for London Office.

Engineering degree or professional qualifications with wide practical experience of oil refinery/chemical plant instrumentation. Salary commensurate with responsibilities in this senior post. Write, giving full details of age, experience.

BOX NO. 2367
ELECTRICAL TIMES (C 544p)

A VACANCY exists for an experienced ENGINEER to take charge (under a Departmental Manager) of the production of dry-core telephone cables. Applicants must have good knowledge of the technical requirements of such cables and experience of the type of machinery used for its production. Initiative in devising improved techniques is required, together with the general engineering and administrative ability necessary for running a busy factory at high output. Preferred age is between 30 and 45 years.—Applications, stating salary range in which interested, to be made in writing only, to the Works Manager, Pirelli-General Cable Works, Ltd., Eastleigh, Hants, not later than February 26, 1953. (C 529)

A WELL-KNOWN COMPANY in the Midlands requires a JUNIOR TRANSFORMER DESIGN ENGINEER. Previous experience of this type of work is essential. Housing assistance may be offered to suitable candidates.—Apply with full details, quoting Ref. BBE, to Box No. 2395, Electrical Times. (C 642)

AGENT required in Midlands for old-established company manufacturing good-class electric lighting fittings.—Fredk. Thomas and Co., Ltd., Everton Buildings, Stanhope Street, London N.W.1. (C 665)

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS for design, operation and maintenance of ground mechanical and electrical works services on R.A.F. and Civil Aviation Stations home and overseas. Appointments in higher grade—£970 rising annually to £1,290; in lower grade—£628 at age 25 to £875 at age 34 (maximum starting salary) rising annually to £970. Provincial rates somewhat lower; appointments non-pensionable. For overseas posts an annual allowance up to £1,300 according to location. Only natural born British subjects. Minimum qualifications and experience (i) (a) University degree or equivalent in electrical and/or mechanical engineering with two years' apprenticeship, or (b) Graduate or Corporate Membership of the Institution of Electrical or Mechanical Engineers with appreciable electrical engineering experience and three years' apprenticeship, and (ii) been in responsible employment for at least three years with well-established engineering concern.—Application forms quoting D.250/52/A from M.I., and N.S., Technical and Scientific Register (K), Almack House, 26 King Street, London S.W.1. (C 666)

APPLICATIONS are invited for the position of SENIOR TRANSFORMER DESIGN ENGINEER for transformers up to 10,000 kVA at 66 kV. Housing accommodation available.—Please apply, giving full details of qualifications and experience, to Box 2393, Electrical Times, marking your application "Senior Transformer Engineer." (C 640)

APPLICATIONS invited for Lamp and Lighting SALESMAN in the Lancashire and Cheshire areas. Previous experience essential. Salary and expenses, staff pension scheme in operation.—Apply in writing, giving full details, to the District Manager, The British Thomson-Houston Co. Ltd., 15 Quay Street, Manchester 3. (C 639)

ASSISTANT AREA REPRESENTATIVE required, resident in Middlesbrough or Newcastle-on-Tyne area. Conversant with sale of low tension switch and distribution gear. To work under jurisdiction of Area Manager, and be responsible for sales in Northern Counties. Previous experience essential.—Full details to Bill Switchgear Ltd., Aston Lane, Perry Barr, Birmingham 20. (C 692)

ASSISTANT POWER STATION SUPERINTENDENT required by large British company for Middle East. He must be under 40 and be capable of operating oil- or gas-fired steam power station; should hold chartered qualification and have had 10 years' steam power station experience. Emoluments over £1,600 p.a. The post is pensionable and the man appointed would qualify for paid home leave after two years' service.—Write, quoting No. 321, to Box No. 6547, c/o Charles Barker and Sons Ltd., 31 Budge Row, London E.C.4. (C 641)

B.B.C. requires FILM SOUND MECHANIC for Television Service. Duties, maintenance of electrical and mechanical film editing and recording equipment. Experience in fault tracing on amplifiers and associated electrical apparatus essential, also ability to carry out mechanical repairs. Fixed salary £8 16s. per week.—Detailed applications to Appointments Officer, Broadcasting House, W.1, marked "F.S.M.E.T.," within a week. (C 667)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, require OPERATION AND EFFICIENCY ENGINEER at the Bromborough Power Station. Salary £885 £923 per annum. N.J.B. Class "H," Grade 5. Superannuable. Applicants should be Associate Members of the Institution of Mechanical or Electrical Engineers (or have equivalent qualifications), with practical experience in the control and efficient operation of a modern steam generating station.—Application forms obtainable from Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date, March 2, 1953. (C 684)

DRAUGHTSMEN required for Transformer Drawing Office, previous experience of Power Distribution, Radio or Welding Transformers is desirable. Progressive positions are offered to men with initiative in expanding Department of modern works on Merseyside. Housing assistance available for selected applicants.—Reply, giving details of age, experience, present occupation and quoting Ref. AFA to Box No. 2365, Electrical Times. (C 543)

ELECTRIC lamp manufacturers in the London area have several vacancies for TECHNICAL ASSISTANTS in connection with lamp development and process control. Applications are invited from persons having one or more of the following qualifications:—

(*a*) Wide lamp-making experience.
(*b*) B.Sc. degree or equivalent.
(*c*) Inter B.Sc. or equivalent.

Salaries will be offered from £450 per annum, according to age and qualifications.—Write giving full particulars to Box No. 2417, Electrical Times. (C 690)

ELECTRICAL DESIGN DRAUGHTSMAN with ONC (or Higher) and some experience of lighting and power layouts for refinery, chemical or similar plants required for London office of leading engineering company. This post offers good salary, sickness and pension benefits in a progressive organisation.—Give full details of age, qualifications and experience to Box No. 2429, Electrical Times. (C 704)

ELECTRICAL DRAUGHTSMAN required for large Sheffield steelworks. Experience is desirable, but not essential, in the preparation of wiring diagrams, shop layouts for lighting, heating and service trenchwork and to be capable of taking measurements on site and preparing cable plans and schedules, together with general service records.—Apply, stating age and details, to Box No. 2387, Electrical Times. (C 625)

ELECTRICAL DRAUGHTSMAN required for large paper mill by Bowater's Thames Paper Mills, Ltd., at Northfleet, Gravesend, Kent. Must be experienced in layout of power installations, wiring diagrams and switchgear. Some mechanical experience an advantage.—Please state age, experience, qualifications and salary required. (C 643)

ELECTRICAL ENGINEER required as general technical assistant in Overhead Line Insulator Department. Duties will be connected primarily with technical aspects of design and manufacture. The post is superannuable and offers opportunities for promotion. Degree in electrical engineering is an essential qualification and a recognised apprenticeship with a large industrial manufacturer desirable. Age 25 to 30. Salary according to age, experience and qualifications.—Replies to be addressed to Chief Personnel Officer, Pilkington Brothers Ltd., St. Helens, Lancashire. (C 626)

ELECTRICAL ENGINEER with University Degree or Higher National Certificate required for Research Work on Lightning Fault Statistics of the British Supply Industry. Some knowledge of electrical supply practice desirable but not essential. Remuneration according to qualifications in the range £400 to £500. The Association operates superannuation under the F.S.S.U. for eligible permanent employees.—Applications to be made to the Director, The Electrical Research Association, 5 Wadsworth Road, Greenford, Middlesex. (C 627)

ELECTRICAL INSPECTOR required. Knowledge of fractional horse-power motors essential. Also an inspector for switches and relays, etc.—Call, phone or write: Personnel Manager, Frigidaire, Stag Lane, N.W.9 (Colindale 6541.) (C 656)

ESTIMATOR required immediately in Contracts Department to assist in preparation of tenders for overhead transmission lines; some experience and technical knowledge an advantage but not essential. 5-day week. Staff canteen. Pension fund.—Apply, Staff Officer, British Insulated Callender's Construction Company Limited, 21 Bloomsbury Street, London, W.C.1. (C 686)

Two Technical Assistants

required by a large firm of Engineers and Shipbuilders.

One to prepare schemes and estimates for a.c. machines having ratings from 100 kVA 5,000 kVA and associated installations of switch and control gear.

The other Assistant to deal with correspondence relating to contracts for a.c. machines and switchgear, and to undertake the investigation of technical problems arising in connection with contracts.

Higher National Certificate in Electrical Engineering or equivalent qualifications are required, together with industrial experience, preferably in connection with design, contracts or estimating.

In replying give full particulars of age, training and experience, also state salary required.

BOX NO. 2383,
ELECTRICAL TIMES. (C 579p)

IMPERIAL CHEMICAL INDUSTRIES LTD., General Chemicals Division, invite applications for the following vacancies:—

SENIOR ASSISTANT ENGINEER (GENERATION), P.1

Applications are invited for the position of additional senior assistant engineer in the Generation Section of the company's Power Department, Runcorn, Cheshire. The duties are to assist, under the direction of the Generation Section manager in the headquarters of the department with the operation and maintenance of the division's power stations, which have an installed capacity of more than 100,000 kW and with the design of extensions thereto. Applicants, who should be between the ages of 30 and 38 years, and should hold a degree in mechanical or electrical engineering, must have had a sound mechanical engineering training and should have had considerable experience of the operation and maintenance of large modern high-pressure steam power stations. In addition they should have had some experience of the preparation of designs and specifications for new plant and of investigations and tests in connection therewith, while Corporate Membership of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers is also desirable. Commencing salary up to £1,250. The selected candidate will be required to pass a medical examination and to join the company's pension fund.

SENIOR ASSISTANT ENGINEER (MECHANICAL), P.2

Applications are invited for the position of additional senior assistant engineer in the Mechanical Section of the company's Power Department, Runcorn, Cheshire. The duties are to assist, under the direction of the Mechanical Section manager in the headquarters of the department with the maintenance of the mechanical equipment of the division's power stations, which have an installed capacity of more than 100,000 kW, and with the design of extensions thereto. Applicants, who should be between the ages of 30 and 38 years, and should hold a degree in mechanical engineering, must have had a sound mechanical engineering training and should have had considerable experience of the maintenance and design of the mechanical equipment of large modern steam power stations. In addition, they should have had some experience of the preparation of designs and specifications for new plant and investigations and tests in connection therewith, while Corporate Membership of the Institution of Mechanical Engineers is also desirable. Commencing salary up to £1,150. The selected candidate will be required to pass a medical examination and to join the company's pension fund.

Applications in writing, giving age and full particulars of education, technical qualifications, engineering training and power station experience, should be sent to the Staff Manager, Imperial Chemical Industries Ltd., General Chemicals Division, Cunard Building, Liverpool 3, quoting reference P.1 or P.2 as appropriate. (C 437)

LANCASHIRE DYNAMO AND CRYPTO, LTD. have vacancies for COLLEGE GRADUATES for two-year apprenticeship course. Applicants must possess a B.Sc. degree or Higher National Certificate in electrical engineering. Suitable applicants will be eligible for permanent position after completion. Pension scheme in operation.—Applications, stating details of training, experience and age to Personnel Manager, Lancashire Dynamo and Crypto, Ltd., Trafford Park, Manchester 17. (C 644)

M.K. ELECTRIC LTD. require a REPRESENTATIVE for the South West of England and South Wales. Applicants, who should be car owners, must have first-rate contacts throughout the area.—Apply in strict confidence to the Sales Manager, M.K. Electric Ltd., Wakefield Street, London N.18. (C 601)

OIL REFINERY CONTRACTORS require a qualified ENGINEER to be responsible for specifying and selecting all types of pumps, motors, turbines, compressors, etc., used in the refining industry.—Applicants should have had past experience of such equipment, particularly the application of process type centrifugal pumps to the petroleum industry. Write fully, Foster Wheeler, Ltd., 3 Ixworth Place, London S.W.3. (C 645)

PIRELLI-GENERAL CABLE WORKS LTD. require TRANSMISSION LINE SURVEYORS, CONTRACTS ENGINEERS, FOREMEN and LINESMEN with experience of wood pole construction.—Write, giving full particulars of experience and salary required, to Overhead Lines Department, Eastleigh, Hants. (C 602)

POWER CABLE JOINTERS required for home and overseas. Applicants with 33 kV experience preferred.—Write stating age and experience to Box No. 3167, c/o Whites' Ltd., 72-8 Fleet St., London E.C.4. (C 688)

POWER PLANT AND SERVICES ENGINEER required for large factory in Manchester area. Plant comprises large modern h.p. water tube boilers, back pressure and condensing turbo-alternators, air compressors, deep well and service pumps, high pressure hot water heating services, and h.t. and l.t. electrical distribution services carrying loads of 10,000 kW. Applicants must have comprehensive and recent experience in operating such plant at maximum efficiency and maintaining it in the highest state of reliability. Salary up to £750, according to qualifications. A pension scheme is in operation.—Applications to state age, experience and technical qualifications, marking envelopes "Power Plant," to Box No. 2419, Electrical Times. (C 691)

REQUIRED, synchronous motor PRODUCTION ENGINEER, capable of organising and taking control of a works department shortly to be started for the production of small synchronous motors. South of England. Only applicants with full experience of this type of work should apply.—Write, stating particulars, salary required, etc., Box No. 2369, Electrical Times. (C 560)

SITUATION AVAILABLE for ENGINEER in London Repair Shop with technical and practical experience in repairs to electrical plant. Applicant need not necessarily be an armature winder, but ability to supervise breakdown staff is essential.—Write, stating age, experience to Box No. 2397, Electrical Times. (C 646)

TRANSFORMER ASSEMBLY INSPECTOR required with good practical experience of transformers up to 10,000 kVA. Salary according to qualifications.—Apply Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (C 605)

TRANSFORMER DRAUGHTSMEN required with some experience on units in the range 500 to 10,000 kVA. Salary according to qualifications.—Apply Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (C 604)

TRANSFORMER ENGINEER DESIGNER required for works in the London area with experience of 132-kV and higher voltages. Applications will be treated confidentially and should give particulars of age, experience and salary required.—Apply Box No. 2389, Electrical Times. (C 630)

TRANSFORMER TESTER required to take charge of test-bed dealing with units up to 10 MVA. Candidate should be capable of carrying out complete tests to the satisfaction of inspecting engineers.—State experience and salary required to Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (C 603)

WELL-KNOWN electric cooker manufacturers require a LADY DEMONSTRATOR with experience to cover the North of England including Yorkshire.—Apply with full particulars to Box No. 2415, Electrical Times. (C 689)

WINDER, London area, all types of a.c. and d.c. rewinds, preferably accustomed low-voltage work. Steady appointment for suitable man.—Age, experience to Box No. 2399, Electrical Times. (C 647)

YOUNG TRANSFORMER SALES ENGINEERS required. Degree or equivalent standard. Previous transformer experience an advantage.—Applications in writing, giving details of education, training, experience and expected salary to Fuller Electrical and Manufacturing Co. Ltd., Fulbourne Road, Walthamstow, E.17. (C 687)

APPOINTMENTS WANTED

GERMAN SPECIALIST (DOCTOR ENG.), well-known owner of factory Eastern Germany, manufacturing motor control and switchgear (low and high tension), experienced in design and research (books published) of apparatus for cranes, lifts, machine tools, distribution boards, etc., desires leading position or partnership Great Britain or Empire. Some capital and many designs available.—Box No. 2421, Electrical Times. (C 693)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (C 16)

ARMATURE REWINDING SERVICE to the Trade—Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum Cleaner and Drill Armatures replaced from stock. 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make.—Regam Electric Cleaner Service, 95-97 Park Lane, Leeds 1. (C 657)

METALWORK. All types cabinets, chassis, racks, etc. to your own specification.—Philpott's Metalworks Ltd., Chapman Street, Loughborough. (C 20)

WIREWORK inquiries invited. Guards, screens, partitions, baskets, trays, panels, machinery and window guards, etc.—Wire Products (Denton), 96 Town Lane, Denton, Lancs. Tel.: Denton 2470, 3901 2. (C 352)

WIREWORK inquiries invited. Guards, screens, partitions, baskets, trays, panels, machinery and window guards, etc.—Wire Products (Denton), 96 Town Lane, Denton, Lancs. Tel.: Denton 2470, 3901 2. (C 353)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (C 695)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (C 10)

ALTERNATORS, 2·75 kVA, by Crompton Parkinson required in quantities.—Box No. 2373, Electrical Times. (C 563)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (C 6)

WANTED: E.N.31 Bar, 5¼-in. dia. min. bright, 5⅛ in. dia. min. black, up to 5¼ in. dia. max. When replying state lengths available.—L. B. McDonald, Ltd., Anne Road, Birmingham 21. (C 648)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (C 1)

WANTED, Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath, Staffs. (C 2)

WANTED, one 100/120 kVA revolving field ALTERNATOR, 3-phase, 50 cycles, 415 V, 4-wire, 2 or 3 bearings, speed 750 or 1,000 r.p.m.—Give make and full particulars to John E. Schofield (1946), Ltd., Netherfield Works, Calder Road, Ravensthorpe, Dewsbury. (C 702)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (C 8)

AGENCIES

COMMISSION AGENTS wanted, calling on wholesalers, Eastern and southern areas available. Wrought iron lighting fittings, health lamps, ships' fittings, conduit fittings. Please give full information in confidence, and state area covered.—Box No. 2401, Electrical Times. (C 649)

FOR SALE

CABLES & WIRE

CABLE. New 7 amp. unirubber, 100,000 yards, for sale at a special price.—Box No. 2405, Electrical Times. (C 658)

FOR SALE, 47 silk-covered Eureka WIRE; 500 lbs; as new.—Box No. 2423, Electrical Times. (C 694)

ENGINEERING PLANT & MATERIALS

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

THE BRITISH ELECTRICITY AUTHORITY invite tenders for the removal and sale of scrap plant at the Nottingham Power Station. The plant includes the removal of eight STEAM BOILERS, each rated at 55,000 lb hr, and also COAL and ASH HANDLING PLANT.

The specification of the plant and conditions of sale No. 6 Nottingham 56 M.25 may be obtained from the Divisional Controller, B.E.A. East Midlands Division, Barker Gate, Nottingham, quoting ref. GC/FF/GGT.

Application in writing should be accompanied with a deposit of £2, which will be returned upon receipt of a bona-fide tender. The specification is not transferable.

Tenders are to be delivered to the Divisional Controller not later than 12 noon on Monday, March 16, 1953. (C 631)

QUANTITY of PRESS TOOLS, blanking and piercing for electric irons, fires and toasters, also boalsters and sub-press.—H. Histon, Ltd., New Summer Street, Birmingham 19. (C 590)

40 TONS F C STEEL ROUNDS, 30 tons SHEETS, under current prices.—Dyas and Fowle, 41 Loudoun Road, N.W.8. Tel.: MAI 5489, 8641. (C 504)

GENERATING PLANT

DIESEL-DRIVEN GENERATING SETS.

930-kVA (550 kW) M.A.N. SIEMENS SCHUCKERT. Engine vert., 8-cyl., 2 stroke, water cooled, 375 r.p.m., direct coupled Alternator 6,300/3.50, 4 wire. Can be reconnected for 3,300 V.

400/450-kW CROSSLEY/CROMPTON PARKINSON. Engine vert., 6-cyl., 4 stroke, 375 r.p.m., direct coupled Generator 460 V. d.c., 3 wire.

250-kVA DEUTS/SIEMENS SCHUCKERT. Engine vert. 7-cyl., 4 stroke, rated to develop 290 h.p. at 500 r.p.m., compressed air starting, direct coupled Alternator, 6,300/3.50, 0.76 p.f. Direct coupled exciter.

220-kVA (165-kW) NATIONAL L.D.C. Engine type FA5, vert., encl., 5-cyl., 4 stroke, speed 428 r.p.m., direct coupled Alternator 440/3.50, 0.75 p.f., 288 amps. 175 kW, 0.8 p.f., 12 hour rating, 428 r.p.m. with direct coupled exciter.

Three 200-kVA BELLISS & MORCOM BRUSH, engine vert., 6-cyl., 4 stroke, 600 r.p.m., direct coupled new Alternator 400/3.50. With control gear.

George Cohen Sons & Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, near Leeds. Tel.: Pudsey 2241. (C 650)

MOTOR GENERATOR SETS, CONTROL PANELS, built to individual requirements. Good deliveries at competitive prices. All equipment guaranteed.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (C 668)

ONE 55-kW A.B.O.E. diesel-electric GENERATING SET, comprising McLaren engine alternator and switchgear. Run for only two or three weeks. £1,200. —London Rubber Co., Ltd., North Circular Road, Chingford, E.4. (C 651)

TRANSFORMERS & CONVERTORS

FOR SALE. TRANSFORMER by Metropolitan Vickers' 600 kVA. 11,000/400/440 V, 3 phase, 50 c.s. Also two 150-amp., 6,600 V T.P. Ferguson Pailin non-automatic, lever-operated, oil-break ISOLATORS in steel cubicle.—Box No. 2403, Electrical Times. (C 700)

TRANSFORMERS
Miniature to 25 KVA
Air and Oil Cooled
Voltage to 11KV
R. M. ELECTRIC LTD.
TEAM VALLEY GATESHEAD 11
(C 608p)

MOTORS & STARTERS

All types and sizes of
Industrial Electrical Equipment

ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London N.W.9.
Telephone: COLindale 4621/2. (C 15p)

A.A. ELECTRICAL CO. FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105. Chiswick 5605, 67 Rothschild Road, W.4. (C 9)

A.C. and D.C MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (C 4)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (C 11)

ELLISON Slip-ring MOTOR STARTER with separate oil rotor starter 10 h.p., 400 volts. £29.—Circle Farms Ltd., Lodge Farm, Ashbourne, Derbyshire. Tel.: Ashbourne 370. (C 699)

FOR ELECTRICAL MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (C 14)

FOR SALE—160 h.p. ELECTRIC MOTOR, 1,460 r.p.m. 400/3 phase. 50 cycles, squirrel cage, in good condition. Price, £150.—Apply, Cementation Co., Ltd., Lowgill Bentham, Nr. Lancaster. Tel.: Bentham 357. (C 698)

GEARED MOTORS, new, in stock. From 1 r.p.m. to 4 h.p. spur or worm gears by well-known makers.—Super Power Ltd., 81 North Side, Clapham Common, S.W.4. Battersea 3355. (C 429)

MOTORS, fractional. All types, all sizes, including flame-proof and geared, speeds 1 r.p. week to 2,000 r.p.m.—Jeary Electrical Co., Ltd., 324 Old Street, E.C.1 (Tel.: Sho 7511). (C 697)

NEW A.C. MOTORS FROM STOCK. ¼ to 200 h.p. 400 V 3 ph. 50 cycles at 600, 750, 1,000 and 1,500 r.p.m. Immediate dispatch, competitive prices.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (C 669)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each, subject.—F. W. Blanshard, Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (C 17)

METERS

A.C.D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (C 7)

HOUSE-SERVICE METERS, a.c. or d.c., quarteryl or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 12)

SWITCHGEAR

LARGE quantity of new and unused SWITCH FUSES and MAINS DISTRIBUTION BOARDS for sale at special clearance prices. Also petrol electric GENERATING SETS. Send for lists.—Uniproducts (Manchester), Ltd., 142 Bolton Road, Pendleton, Salford 6. Phone 1341-3. (C 562)

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (C 13)

UNCLASSIFIED

PRESERVATION PACKING
Inquiries invited by
DENIS FERRANTI METERS LIMITED
Caernarvon Road, Bangor, Caerns.
Contractors to the Ministry of Supply, Ministry of Works, Air Ministry and the Crown Agents for the Colonies. (C 580p)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SALE BY TENDER

THE Merseyside and North Wales Electricity Board offer for sale the undermentioned equipment:—

Item 1: One A. Gilkes and Gordon water Turbine Set with governor gear, directly coupled to Laurence Scott 20 kW, 220 V, 91 amp, 840 r.p.m. compound-wound continuous rating d.c. generator.

Item 2: One 2-cylinder National Gas 15 h.p. Oil Engine.

Item 3: One A. Gilkes and Gordon water Turbine Set with governor gear. One Laurence Scott 10 kW, 220 V, 45·5 amp, 1,155 r.p.m. compound-wound, continuous rating d.c. generator.

Item 4: One B.T. Balancer; 2 direct-coupled d.c. machines, 100 V, 70 amp, 1,100 r.p.m.

Item 5: One 3-cylinder National Oil Engine with Bosch injection system; directly coupled to 20 kW, 230 V, 1,100 r.p.m. d.c. generator.

Item 6: One 6-panel Switchboard with 11 ammeters, 2 voltmeters and 5 d.c. kWH meters.

(Items 1-6 are situate at LLANDINAM, MONTGOMERYSHIRE, and appointments to inspect should be made with Mr. F. O. Harber, the Board's District Engineer at Electricity House, 6 Salop Road, Oswestry.)

Item 7: A Laurence Scott 10 h.p. d.c. Motor—29 amps, 300 V, 300/600 r.p.m.

Item 8: A 7-panel G.E.C. M.C. M.V. Switchboard with 4 C.T. breakers, lighting panel, sync. panel and emergency link cubicle.

Item 9: Two 3·3 kV G.E.C. Circuit Breakers.

Item 10: Two change-over Link Units.

Item 11: One C.P. (truck) M.V. Switch.

(Items 7-11 may be inspected at the Board's Depot at LEGACY, NR. WREXHAM.

Item 12: Twelve 6·6 kV Type C.1 M.C. Reyrolle Oil Circuit Breakers.

(Item 12 may be inspected at the Board's Central Stores, H.M. Factory Site, QUEENSFERRY, NR. CHESTER.)

Item 13: Two B.T.H. cubicle-type "O" 300 amp, 6·6 kV O.C.B.s with P.T.s, C.T.s.

(Item 13 may be inspected at the Board's Electricity Works, CWM ROAD, LLANDUDNO.)

Item 14: One 5-cylinder 167 h.p. National Oil Engine; direct drive to 100 kW, 250 V, 400 amp, 500 r.p.m. Gerber d.c. generator.

Item 15: One 3-cylinder 141 h.p. 255 r.p.m. Blackstone OIL ENGINE; belt drive to 85 kW, 250 V, 348 amp, 980 r.p.m. compound-wound C.P. d.c. generator.

Item 16: One 2-cylinder 76 h.p. 255 r.p.m. Blackstone Oil Engine; belt drive to 40 kW, 230 V, 196 amp, 970 r.p.m. d.c. generator.

Item 17: One 24 h.p. 650 r.p.m. Blackstone Oil Engine; 3 V-belt drive to 15 kW, 255 V, 55 amp, 1,500 r.p.m. Stamford generator.

Item 18: One 5-panel Switchboard with instruments.

(Items 14-18 are situate at LLANIDLOES, MONTGOMERYSHIRE, and appointments to inspect should be made with Mr. F. O. Harber, the Board's District Engineer, at Electricity House, 6 Salop Road, Oswestry.)

Item 19: One Metering Panel, one rotary synch, three 50 amp, 200/250 V single-phase w.h. meters; one outgoing panel (4-way), 3 x 60 amp fuses per way.

Item 20: Sets 1 and 2, each consisting of Type S, semi-diesel, 2-cylinder Petter engine, 18 b.h.p., 600 r.p.m., directly coupled to 15 kVA, 400 V, 3-phase, 50-cycle C.P. alternator. D.C. exc. voltage 13·5/32 continuous rating, 600 r.p.m.

C.P. shunt-wound exciter, 13·5/32 V, 12·5/30 amp, 600 r.p.m. Switchboard, 0-500 voltmeter, 3 ammeters (0-30), voltage regulator.

Item 21: Set No. 3: One cold-starting 2-cylinder Petter Auto. Diesel Engine, 72 b.h.p., 500 r.p.m.; directly coupled to 56·25 kVA, 440 V, 3-phase, 50-cycle, C.P. alternator. D.C. excitation voltage, 26. 500 r.p.m.

C.P. shunt-wound exciter, 26 V, 63 amp, 500 r.p.m. Switchboard, 0-500 voltmeter, 3 ammeters (0-100), comp. voltage control, voltage regulator, switch and fuses.

Item 22: Set No. 4: One—cold-starting 2-cylinder Petter Auto. Diesel Engine, 72 b.h.p., 500 r.p.m.; directly coupled to 46·5 kVA, 400 V, 3-phase, 50-cycle G.E.C. alternator. D.C. excitation, voltage 115. 500 r.p.m.

G.E.C. shunt-wound exciter, 1·84 kW, 115 V, 16 amp, 500 r.p.m., with auto. voltage regulator. Switchboard, 0-500 voltmeter, 3 ammeters (0-150), G.E.C. circuit breaker, voltage regulator and switch.

(Items 19-22 are situate at CAERSWS, MONTGOMERYSHIRE, and appointments to inspect should be made with Mr. F. O. Harber, the Board's District Engineer, at Electricity House, 6 Salop Road, Oswestry.)

Item 23: Two sets, each consisting of B.P. Motor Converter, 120 kW, 3-phase, 50-cycle, 2,750/2,950 V, 750 r.p.m. motor; 440/550 V, 275/220 amp, 750 r.p.m. d.c. generator.

Resistance starter and 120 kVA, 6·6/3 kV transformer.

Item 24: One set, comprising 2 Bertram Thomas 220 V, 170 amp, 1,000 r.p.m. d.c. Motors, and two 0-100V, 120 amp, 1,000 r.p.m. d.c. Generators on same shaft.

(Items 23 and 24 may be inspected at the Board's Electricity Works, IVY STREET, COLWYN BAY.)

(Continued in next column)

(Continued from previous column)

These items of equipment are offered for sale individually or as a whole, without guarantee as to their condition.

Forms of tender, obtainable from the undersigned, must be forwarded, duly sealed in the official envelope provided, so as to be received at Electricity House, Rhostyllen, Nr. Wrexham, not later than the first post on Monday, March 9, 1953.

The Board do not bind themselves to accept the highest or any tender, and reserve the right to accept any portion of a tender.

R. N. PEGG,
Sub Area Manager.

No. 4 Sub Area,
Electricity House,
Rhostyllen, Nr. Wrexham.
February 6, 1953. (C 652)

A.C. and d.c. MOTORS, DIESEL ALTERNATOR SETS, GENERATORS, TRANSFORMERS, WELDERS, PLATING PLANT, CONTROL GEAR, SWITCHGEAR, PORTABLE TOOLS, etc. Stock list post free.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (C 670)

FOR SALE, COLD ROOM manufactured by Messrs. J. and E. Hall. Internal dimensions are 4 ft 4 in by 6 ft by 6 ft 4 in. high. Four tray ice box, 4 rails for hanging meat, etc., 2 fish compartments. Powered by 1 h.p. 220-240 V 2 phase, or 380-420 V 3 phase. Four shelves along one side, one shelf along the other side and one along the back. Offers are invited, and inspection can be made by appointment.—Write, Box No. 2409, Electrical Times. (C 671)

FOR SALE, one Autolec electrode STEAM RAISER, suitable for use on 400 V, 3-phase, 4-wire circuit, 150 kW rating. Steam capacity 500 lb per hour. Working pressure 75 lb per sq in. Completely automatic in perfect working order.—Box No. 2411, Electrical Times. (C 672)

PORCELAIN (vitreous) steel NAMEPLATES and DANGER SIGNS for the electrical industry, including 6 in. x 2 in. and 6 in. x 4 in. danger h.v. Inspection Notice, locked switch and fire switch plates.—Write for list or samples: Foicik Ltd., 36-38 Western Road, London E.13. GRA. 4524. (C 548)

SPECIAL clearance offer. Approx. 500 new and unused "Certostat" THERMOSTATS, 11½ in. long, complete with jackets. Type T/400, 1,100° to 1,500° Fahrenheit, a.c., 0·15 amp., 0·250 V, d.c. 0·1A-0·250 V, incorporating a Burgess micro-switch, all in original cartons. Price 12s. 6d. each ex works.—Uniproducts (Manchester) Ltd., 142 Bolton Road, Pendleton, Salford 6. Tel.: Pen. 2403. (C 703)

1 FERRANTI 7·5 kVA, single-phase, 200-250 V VOLTAGE REGULATOR, secondhand. £50.—Box No. 2407, Electrical Times. (C 659)

MISCELLANEOUS

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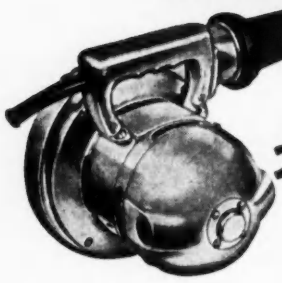

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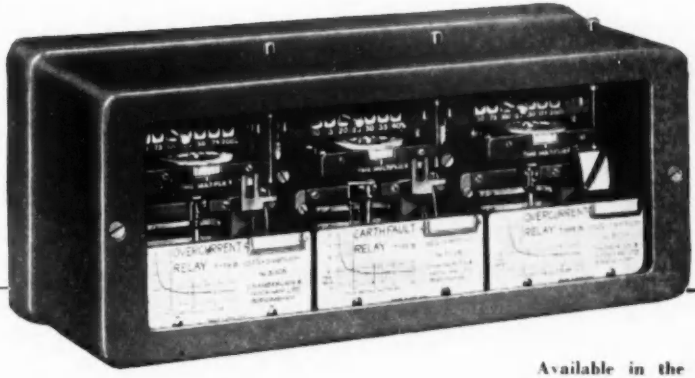

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150	720	Brook	S. Protected	Slip Ring
150	960	Brook	S. Protected	Slip Ring
145	290	Westinghouse	Protected	Slip Ring
125	960	Brook	S. Protected	Slip Ring
120	720	Brook	S. Protected	Slip Ring
110	580	Brook	S. Protected	Slip Ring
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100	485	Crom.-Park.	S. Protected 3 brg.	Slip Ring
100	585	Westinghouse	Protected 3 brg.	Slip Ring
100	750	Brook	Protected	Slip Ring
90	960	Brook	S. Protected	Slip Ring
75	720	Brook	S. Protected	Slip Ring
75	960	Brook	S. Protected	Slip Ring
70	960	Brook	S. Protected	Slip Ring
70	1,440	Brook	S. Protected	Slip Ring
60	500	Crom.-Park.	Protected 3 brg.	Slip Ring
60	720	Brook	S. Protected	Slip Ring
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55	1,410	Brook	S. Protected	Slip Ring
50	720	Brook	S. Protected	Slip Ring
50	960	Brook	S. Protected	Slip Ring
45	1,440	Brook	S. Protected	Slip Ring
40	480	Bruce Peebles	T. Enc.	Slip Ring
40	720	Brook	S. Protected	Slip Ring
40	1,465	L.D.C.	T. Enc.	Slip Ring
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30	1,440	Brook	S. Protected	Slip Ring
30	720	Crom.-Park.	S. Protected	Squirrel Cage
28	970	Metro.-Vick.	D.P.F.	Squirrel Cage
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25	520	G.E.C.	E. Vent.	Slip Ring
25	580	Bruce Peebles	T. Enc.	Slip Ring
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25	960	B.T.H.	S. Protected	Slip Ring
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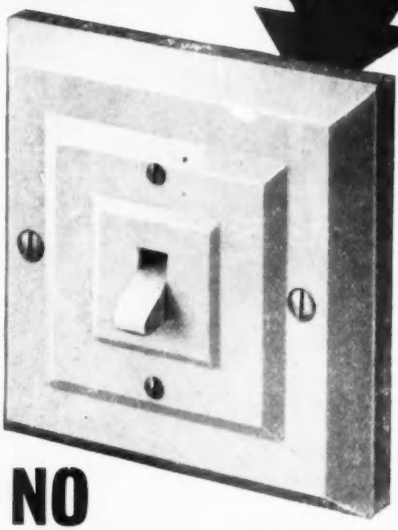

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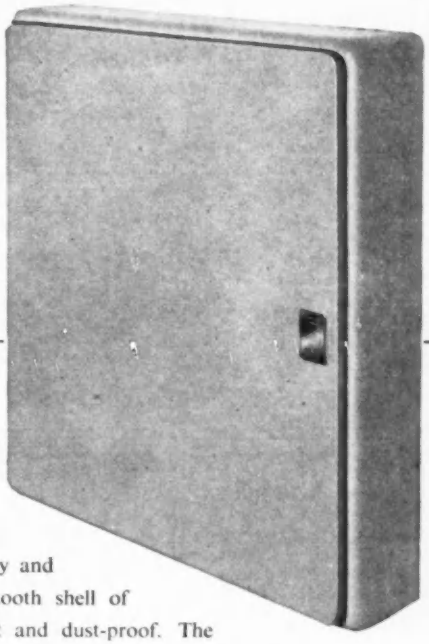

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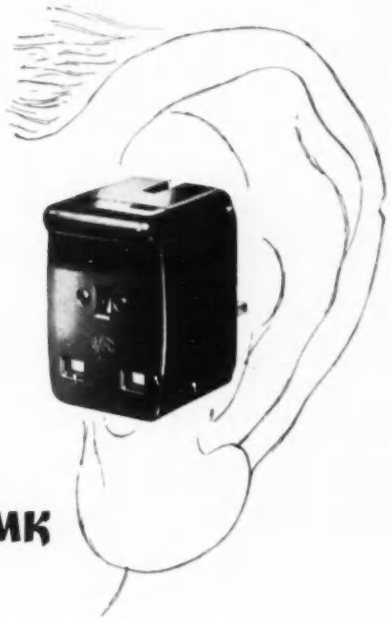

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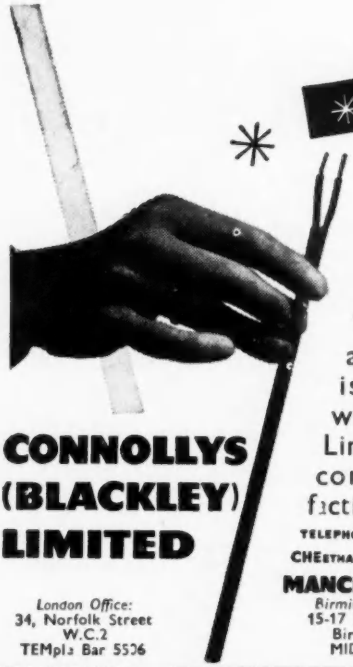

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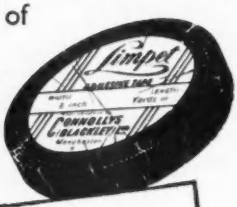

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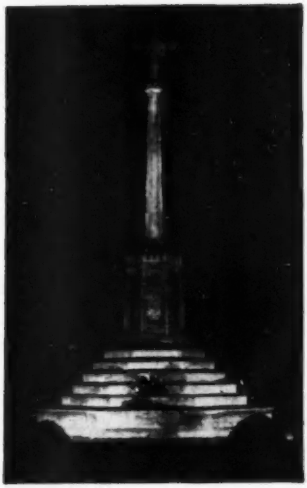

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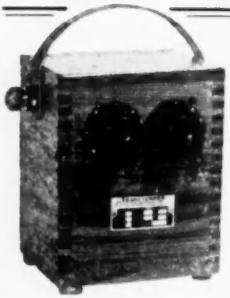

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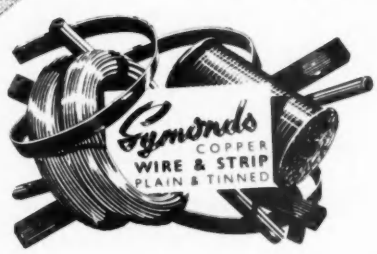

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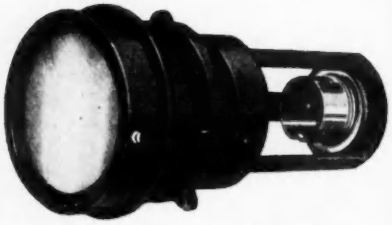

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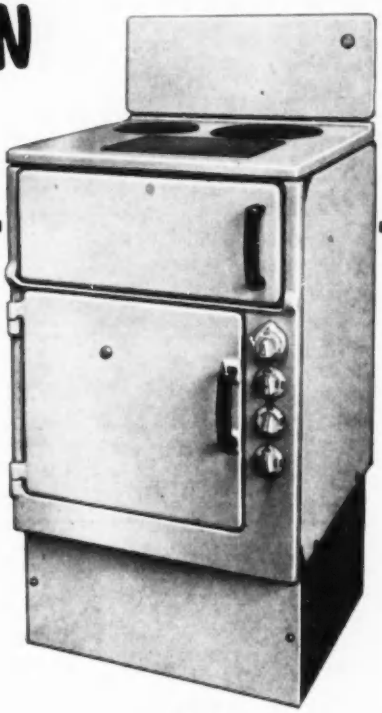

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Total:	**2-plate - - -**	**5,600 watts.**
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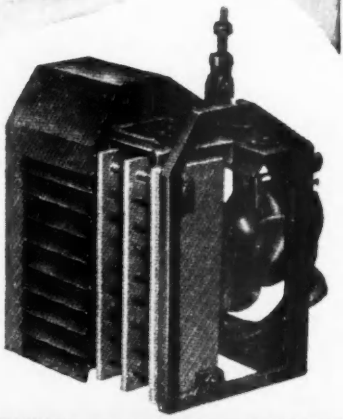

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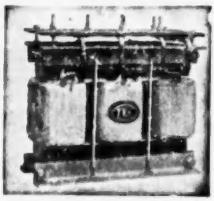

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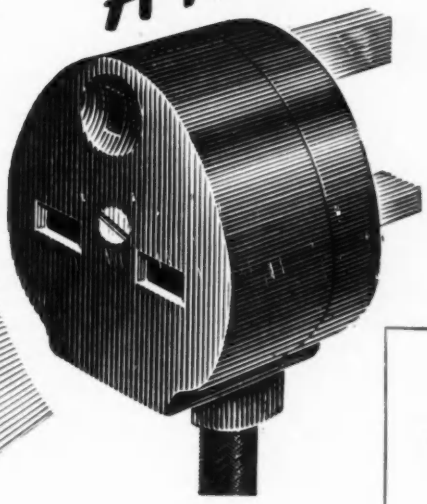
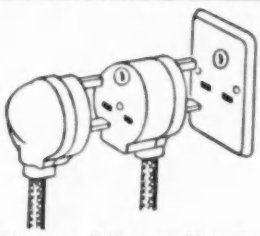


The plug adaptor fits any standard outlet made to B.S. 1363. It incorporates the same simple re-fusing device as is used in the standard Ediswan Clix B.S. 1363 Fused Plug, and the adaptor outlet is shuttered. The re-fusing operation takes only 15 seconds and can be done without dismantling the plug.



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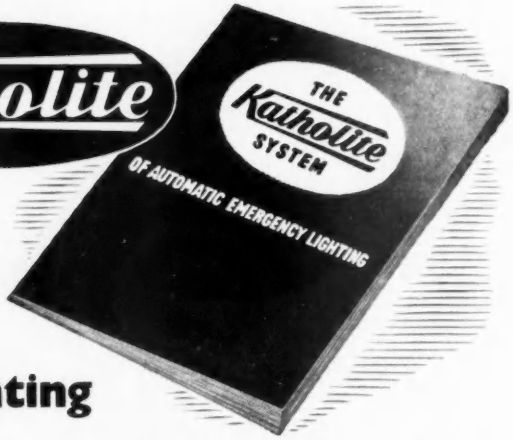

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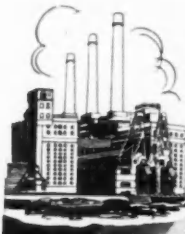

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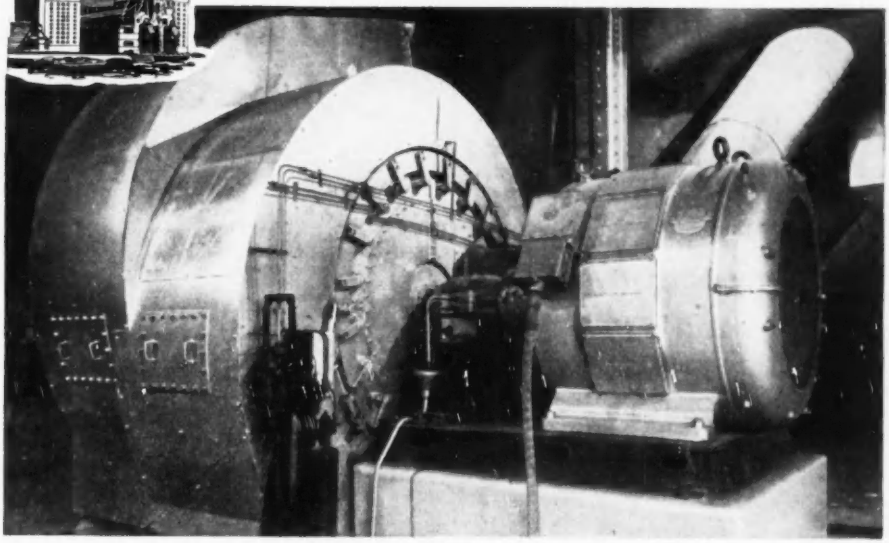

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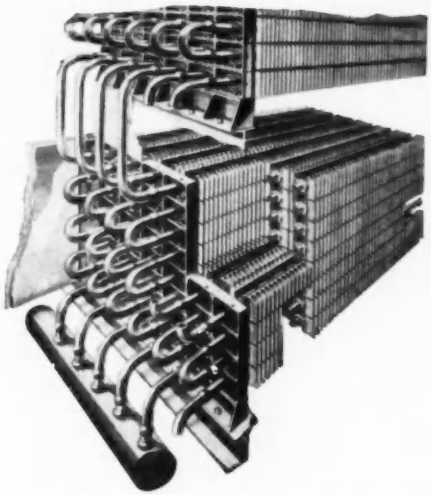

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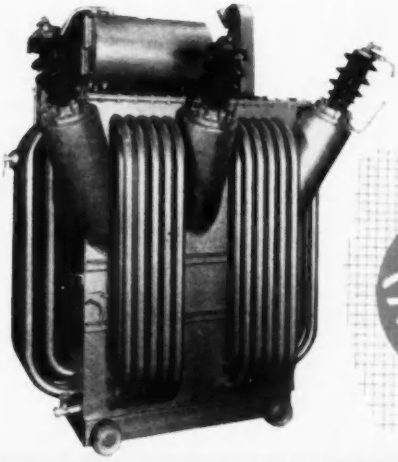

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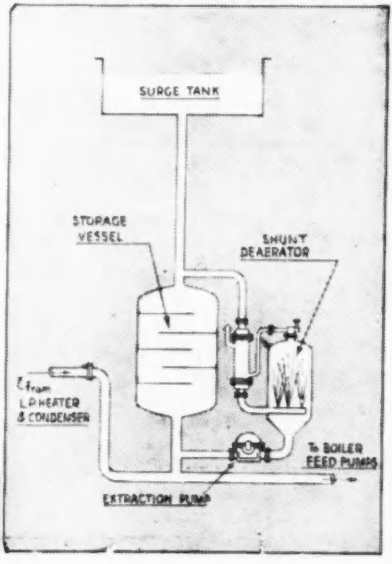

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